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Faculty development to help preservice educators model the integration of technology in the classroom: perspectives from an action research case study

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Faculty development to help preservice educators model the integration of technology in the classroom: Perspectives from an action research case study

by

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Table of Contents

Abstract

This action research case study focuses on faculty development and finding better ways to educate the faculty in modeling technology in their classroom and in their curriculum. Three School of Education faculty members and the Director of Instructional Technology Services at a small, Midwestern, liberal-arts university teamed together using participatory action research to study their practice with hopes of coming to an understanding of ways to remove some barriers to technology literacy and pedagogical issues. Three articles suitable for publication make up the body of the study. Article one is a review of literature in the field of faculty development, media centers, modeling technology, and action research. It describes what is currently happening at other schools pertaining to faculty development strategies. Article two tells the story of three faculty participants' views on modeling technology in the classroom and their cyclical evolution of technology modeling throughout the duration of the study. Simple, effective tools designed to provide technology literacy instruction are described. Article three describes a study of the personal practice of the instructional technology services director at a small, Midwestern, liberal-arts university. It provides insight into his evolution in teaching philosophy as he struggled with his concept of technology literacy instruction while searching for better methods of providing faculty development in that area. The cyclical nature of the participatory action research model he utilized assisted him in improving his practice and in developing an effective educational environment for his clients; the faculty. Barriers related to faculty use of technology in the classroom are explored and ways to help remove these barriers are suggested. Discussed in all three articles is the field of change theory and the concept of people's perspectives and how they deal with innovations and change.

Introduction

This dissertation has at its core three papers suitable for publication. The common themes tying them together are faculty development, modeling technology integration into the classroom, and the action research used to improve the practice. This research is a case of finding improved ways of helping college faculty members become better modelers of technology in their classrooms. As the Director of Instructional Technology Services at a small, rural, Midwestern liberal-arts university, part of my job is to educate faculty on how to use technology in their classrooms and in preparation for their classes. I had been having difficulty discovering ways to motivate and train the faculty in classroom technology use and wanted to research ways to improve my practice.

Key literature encompassing all three articles in this dissertation focuses around faculty development, modeling technology in the classroom, action research, and change theory. I first began my quest for changing the way in which I approached my media center and the training I was providing to the faculty after reading the U.S. Congress Office of Technology Assessment report (1995) *Teachers and Technology: Making the Connection*. This report stated that even though technology can change the way teachers teach, their findings established that a very small percentage was actually using computers for instruction. They suggested that teachers had a limited vision of the potential of technology in the classroom and needed time to experiment, opportunities to use technology without fear of failure or losing their jobs, and training to help them learn new ways of providing instruction using these new tools.

Looking deeper into this dilemma, I found research confirming that higher education faculty tend to teach as they were taught in school (Myers, Miels, & Ford, 1997) and that these faculty model this conservative teaching approach to their students who, in turn, emulate their professors once they get classrooms of their own (Groves & Zemel, 2000). Furthermore, it was determined that preservice teachers were not receiving the technology training they needed in order to teach effectively in their classrooms once they got into the field (Jacobsen, Clifford & Friesen, 2002). Other research found that preservice educators are not actively using technology in their college curricula (Albee, 2003). Even more research established that it is necessary to focus more on student-centered learning than on teacher-directed learning to make greater progress in learning (Beyerback, Walsh & Vannatta, 2001). One key to solving this problem is to break this cycle at the point of teaching preservice teachers how to teach. The literature indicated to me that if college and university faculty were to model technology in their classrooms, preservice teachers would learn by example how to use technology in their teaching careers. I felt I could assist in this mission since educating faculty to use their technology is part of my job. Besides managing the audio-visual media services for the campus, administrating the WebCT online course management system, and supervising six student workers to assist my one-person operation, part of my function at the University is to educate faculty on ways to use technology in their classrooms. The behaviorist style of managing the media aspects of my position was working well. My department had routines for customer service, audio/visual setups, on-line course management, and product development that did not need much change because they were meeting the needs of our institution. However, I did need further understanding about constructivist and student-centered learning and wanted to build a program designed to help faculty develop strategies for this type of teaching and learning. There had been resistance by the faculty in accepting technology as an innovation to use in the classroom for student-centered instruction. My objective for this doctoral research was to find ways to help remove some of the barriers that were keeping faculty from realizing the potential for technology in teaching.

Through a literature search, I found that people learn at different levels and express different concerns dealing with innovations (Hall & Hord, 2001). I also found that people have to recognize an advantage for them to use this innovation in order for them to be willing to change from using the old, more comfortable ways (Rogers, 1995). Traditional media center methods of educating people how to use technology in their teaching tended to center on technology literacy and objective-based outcomes (Heinich, Molenda & Russell, 1982). This method promoted instructing teachers on how to lecture effectively and did not address other ways of approaching the subject matter.

My exploration led me to look to the field of research dealing with faculty development to find what is currently being done to solve this problem. I found that rewards and incentives were helpful in getting teachers to learn new technologies (Brown 2000), that faculty had greater gains in technology literacy if they felt they were part of the decision making process (Drazodowski, Holodick & Scappaticci, 1996), and that technology could not be integrated into the curriculum without the faculty first accepting it (Pryor & Bitter, 1995).

In my opinion, educating instructors how to teach effectively is an important occupation and goal. Guiding teachers to use the technology that is pervasive in our society is also necessary in order to perpetuate the continuation of knowledge growth. Teachers are required more and more to use technology in their classrooms to try to keep pace with the rate of technology growth. Those teachers who have discovered, through research, how to use the newer technologies to improve their schools and their teaching have found ways of reaching more students more effectively, helping them find ways to use technology as a way to bring about change to assist students to become better consumers of information, better scientists, and even better thinkers.

Many preservice teachers are not getting the necessary training to help them in utilizing this new technology in their teaching. It used to be sufficient to educate students by telling them what they needed to know or do. It is becoming increasingly necessary to help students learn how to sift through the large volume of information readily available to them, made possible through improved technology, and to be critical consumers of that information (Dede, 2002).

The technology instruction I was providing to the faculty did not seem to be effective. I needed to analyze my current practice to look for ways to make it better. Action research (AR) was a tool I could use to look for an answer to my dilemma. AR is essentially a systematic process of problem posing and problem solving designed to be carried out by practitioners in the actual practice setting allowing them to both improve and better understand the nature of their practice (Carr & Kemmis, 1986). In carrying out this systematic process of problem posing and problem solving, AR uses an informed trial-and-error approach when seeking to both understand and resolve practice-based problems and issues. When using this research strategy, a practitioner/researcher tries a hunch or intervention, then, after observing, evaluating, and reflecting on the outcomes, typically tries yet another variation of the intervention (Stringer, 1999). Action research is *possibility theory* instead of *predictive theory* as normally practiced in quantitative research (Wadsworth, 1998). AR would allow me to research my question while actually being part of the study. It would allow me to look at my problem critically, suggest different ways to accomplish a change, try the new change, and then look at the situation again to see if things had improved (Lewin, 1948).

In one sense, AR never really ends since it encourages an ongoing cycle of interventions that progressively define and solve practice problems. Since challenges in a practice seldom remain static, solutions cannot either. Furthermore, since one cycle of AR tends to bridge into other cycles of research on the same or similar problems, it often provides the practitioner with a means to test new insights as they appear and to observe systematically how each of these new insights affects practice (Schön, 1983). By its very nature and unlike many other research methods, AR typically demands revision, refinement, and redefinition of the problem itself because it is conducted in the changing world of practice (Carr & Kemmis, 1986). Another very important piece of AR is sharing results with a larger community, both local and global, so other practitioners can benefit from the observations and apply them in similar situations (Carson & Sumara, 1997).

The particular framework of AR chosen for this study was Participatory Action Research (PAR). While interpretivist in nature, PAR is not a research model designed for only one researcher seeking a solution to a problem, but rather for a team of researchers with similar concerns and interests searching for a common solution to a problem. PAR allows the research team to search for understanding in their places of practice and is a way for them to develop new and creative ways of looking at things in their practice (Wadsworth, 1998).

PAR is grounded in the belief that good research is research *with* people rather than *on* people. Researchers utilizing PAR believe that ordinary people are quite capable of developing their own ideas and can work together in a co-operative inquiry group to see if these ideas make sense in their practice and work world. PAR researchers, and action researchers in general, also believe that the outcome of good research is not just books and academic papers, but is also the creative action of people to address matters that are important to them. The entire team contributes to the ideas that go into their work together and are part of the activity being researched. Everyone has a say in deciding what questions are to be addressed and what ideas may be of help. Each member of the team contributes to thinking about how to explore the research question. They all get involved in the activity that is being researched and everybody has input in whatever conclusions the PAR group may reach. Therefore, in PAR, the split between 'researcher' and 'subjects' is done away with and all those involved act together as 'co-researchers' and as 'co-subjects.'

I modeled this study after Earnest Stringer's (1999) Look, Think, Act cyclical approach to AR. This allowed me to continually cycle through several iterations of a model to see what worked best. I recruited a team of three School of Education faculty members to help me in determining what types of technology training worked best for them. The team members selected were representative of the faculty on the university campus in regards to classroom technology use and expertise. Through the recursive nature of AR, these team members were able to give me continual feedback on the nature of how they learned best and what types of training were most effective to them. I chose School of Education faculty because I felt it was important to foster a new cycle of 'teaching the teachers' as they worked with preservice teachers in their classrooms.

Dissertation Organization

The dissertation is organized into six distinct areas: preliminary pages, general introduction, first article, second article, third article, and end pages including the appendices. The appendices include semi-structured interview questions, examples of the instructional 'cheat sheets' mentioned in epiphany #2 below, other raw data, and human subjects approval.

The first article of the three is a literature review of research in the areas of technology modeling and faculty development. It covers three specific areas of research in the field; the lack of modeling technology integration in preservice classrooms and how that lack of modeling affects preservice teachers once they get classrooms of their own, how faculty best learn technology that is to be used in their classrooms, and what other colleges and universities are doing to help their faculties learn how to utilize technology in their classrooms. Several new insights are gained and the stage is set for the case study in the following chapters.

The second article tells the story of what happened to the three faculty team members throughout the duration of the sixteen-week study and how they helped me, the technology consultant, to grow in my understanding of what their training needs were. It follows their growth in technology usage throughout the semester and discusses their thoughts on what might be possible for excellent faculty development programs at our university. Recommendations are also made for what teaching classrooms should look like to make them technology-friendly and allow for more modeling of technology in the classroom.

Over a sixteen-week semester, the case study identified three unique and definite findings, or epiphanies listed below. They were surprising to all four team members but welcomed as points to better approach faculty development and support at the University.

Epiphany #1: Two-person teams learning with the technology consultant provides a more effective learning environment than one-on-one training with the consultant. Throughout the course of the 2002 fall semester, the three faculty members and I met as a team every other week to train, consult, share ideas, concerns and anecdotes, and to brainstorm ways to model technology in the classroom. I interviewed the three faculty members individually prior to the beginning of the study and asked them to keep reflective journals throughout the course of the study. As the technology consultant, I organized weekly times to meet individually with each of the three faculty members for one-on-one training. Two members of the team changed this model at an early stage by suggesting a modified one-on-two training session. The main feature of this model allowed one of the team members to 'eavesdrop' on one-on-one training consultations and allowed for awareness building of new tools and genuine brainstorming of unique ideas of ways to use the technology. It seems the collaborative spirit between the two colleagues sparked ideas of ways to use the technology in ways I, as a division outsider, had not considered. The training accomplished by this modified approach proved to be of a better quality than the one-on-one training.

Epiphany #2: Simple, easy-to-follow one-page instructions with an abbreviated flowchart on the reverse side tend to make for the best recall tools. Throughout the course of the semester, the team tried different models of training. It was quickly understood that one-on-one or even the modified one-on-two training was very time consuming, so the team looked for ways to supplement learning. Short instructional sheets were introduced to help remind participants how to perform certain functions in a software application. Tri-fold brochures were developed as well as very detailed instructions for different functions of the supported software. These worked fairly well, however, what the team decided worked best for all was surprising, if not enlightening. Simple, easy-to-read instructional sheets were designed which could complete an instructional idea on one side of an 8½" x 11" sheet of paper. A bubble flowchart was then printed on the reverse side with the same, albeit abbreviated, information. These short instructional sheets impressed all of the team members as being the most expedient and efficient way to offer 24/7 training-on-demand. They were provided both as physical hard-copy handouts and as Internet Web pages.

Epiphany #3: Technology in the classroom does not necessarily make it a teachable classroom. Four weeks into the sixteen-week study, the team members suggested that, even though there was technology in most of the larger classrooms on campus, there was little technology with which to teach or to model. Classrooms outfitted with Smart Expression® tables (each equipped with a data projector, document camera, VCR player, audio amplifier, and connections to the Local Area Network and the Internet) were perceived predominately as lecture classrooms. The team members wanted to model collaborative learning by providing several Internet-connected computers and a printer for students to work collaboratively on research projects and facility made for students to present ideas to the entire class electronically. Cameras, scanners, wireless networks, and video editing equipment were also suggested as supplemental tools in the classroom. The challenge, then, was to determine creative ways in which to use the currently available technology in the classrooms, but to be careful not to treat technology as a tool looking for a solution.

The third article documents the journey I, as the researcher, took in coming to an understanding of what was happening with my philosophy of technology training and understanding how education had changed over the past twenty years. It describes the path I took in understanding my bias toward lecture and a behaviorist approach to technology literacy and how that conflicted with the way the faculty members wanted to teach. The article describes my telling them how they should be looking at teaching and modeling technology from a constructivist's point of view while at the same time unwittingly forcing the same conventional lecture mode on them with the technology provided.

New literature is introduced to summarize past and present literature on the philosophy of teaching with technology and how it was and currently is modeled in the classroom. In this way, I attempt to get a good picture of my own bias and possible evolution in technology use in education.

Importance of This Research

This research is important to my University because the methods and tools created as a result of the study, such as the 'cheat sheets' and one-on-two training, will help bring about change to the way in which our faculty is educated. I will have the opportunity to put these new ideas into practice and to continue to evaluate and revise my practice and help the faculty become more adept at using technology in their classrooms in student-centered applications. It is important to me as the Director of Instructional Technology Services because it is helping me become a better trainer and technology consultant. As I look at the data and the time spent in developing new ways of looking at faculty development, I have realized a few things about myself that I can immediately change to make that faculty development more effective. This research is also important beyond my local situation because it may help trainers in the same situation at other colleges and universities to find new tools that might work for them in their faculty development. As brought out in the literature review, other schools are having the same conversations about how they need to find better ways of training their faculty. The tools and models discussed in these papers will contribute to that literature and discussion.

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Modeling Technology in Preservice Education Classrooms: A Literature Review

A paper to be submitted to the Journal of Technology and Teacher Education (JTATE)

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Abstract

This article is a literature review of research in the areas of modeling technology integration in the preservice classroom and faculty development to achieve that modeling. It covers three specific areas of research in the field: the lack of modeling technology integration in preservice classrooms and how that lack of modeling affects preservice teachers once they get classrooms of their own; how faculty best learn technology that is to be used in their classrooms; and what other colleges and universities have tried or are currently doing to help their faculties learn how to integrate technology into their classrooms for instruction. Findings indicate that time and resources are formidable barriers to overcome before faculty will accept technology as a viable teaching tool. Preservice teachers need to have technology modeled for them in more than just a single technology course making it possible for them to build a technology-based framework on which to draw from when designing pedagogy for their classes. The literature also provides descriptions and evidence of many colleges and universities that are experimenting with several different ways to help their faculties learn how to use technology in their classrooms to develop student-centered methods for instruction.

An Historical Perspective of Technology and Teacher Education

In 1995 the U.S. Congress Office of Technology Assessment (OTA) projected that by "Spring 1995, U.S. schools will have 5.8 million computers in use for instruction—about one for every nine students. Nevertheless, a substantial number of teachers still report little or no use of computers for instruction" (U.S. Congress OTA, 1995, p. 89). The OTA report also found that colleges of education and systems of teacher development of that era did not adequately prepare teachers to use technology in their teaching. Several studies were launched in response to this OTA survey to determine what could be done to rectify the problem.

In 1995, University of Nebraska - Omaha education recent graduates who had up to two years of teaching experience were surveyed. Evidence was found that a computer-specific course in preservice programs was perceived as very important, especially classes in development strategies to integrate computers into all disciplines. The graduates surveyed in this study did not feel adequately trained in college to use computer-related technology in their classrooms. This mirrored what the OTA report found. These teachers felt that technology was very important to the future of education, that a computer-specific course should have been required in their undergraduate work and that modeling of computer use in methods and general education classes was important, but lacking (Topp, 1995). Survey data was collected around this period of time from first-year teachers that suggested effective integration of technology into classes is extremely motivating and enhances student achievement of course objectives. Interview data confirm these findings and suggest faculty members are motivated as well by the increased use of technology. However, the majority of these first-year teachers surveyed also concluded that they still had not been adequately prepared to teach with computers and related technologies (Strudler, Quinn, McKinney & Jones, 1995).

Freshmen students entering university teacher education programs in the mid 1990s were found to have little or no knowledge about educational technology. It was perceived as an opportune time for professors to train students how to effectively integrate technology into teaching strategies to bring about a change in the traditional educational paradigm of teacher-centered learning (Sheffield, 1996).

In 1998, researchers found that not only did preservice students not know how to use computer technologies in their teaching, they expressed anxiety toward learning how to integrate the technology into their classrooms and were more comfortable with what they viewed as more traditional teaching approaches. The data also show that most preservice teachers took a traditional or conservative view toward using technology in teaching (Laffey & Musser, 1998).

To rectify this problem, many schools of education introduced a single technology course designed to train preservice teachers on the use of computers in education (Hargrave and Hsu, 2000). Even though the single course was found to be the dominant model for training preservice teachers on information technology literacy, the data suggested a growing need for curriculum integration of technology. It was found that technology modeling needed to be infused into all classes the preservice teachers took in order for them to emulate their professors in the use of technology in the classroom (Mullen, 2001).

A study was designed to determine the level of technology preparedness school administrators expected from beginning teachers and compared these expectations with the actual skills the preservice teachers had while in their student teaching assignments. The number of technology experiences these preservice teachers had in their teacher education coursework was also assessed. It was determined that student teachers needed more training in computer-related technology skills and the integration of computer applications within their teacher education courses to come closer to the public school administrators' expectations (Albee, 2003). This study agreed with a national survey initiated by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE) in which U.S. schools, colleges, and departments of education were surveyed to determine how they prepared new teachers to use information technology in their work. They found that, "Faculty information technology skills tend to be comparable to the information technology skills of the students they teach; however, most faculty do not model use of those information technology skills in teaching" (Moursund & Bielefeldt, 1999, 28). What they termed the "Integration Factor" was designed to ascertain how skilled the graduates were in the use of technology within their undergraduate classes. They found this was the best predictor of "basic technology proficiency" (p. 28), and "to increase the technology proficiency of new teachers in K-12 classrooms, training institutions should increase the level of technology integration in their own academic programs" (p. 10).

By the turn of the century, the National Council for the Accreditation of Teacher Education (NCATE) and ISTE had outlined three fundamental concepts and skills needed by all prospective teachers for applying technology in educational settings. The three foundations are: basic computer/technology operations and concepts, personal and professional use of technology, and application of technology instruction (ISTE, 2002). To address this problem of inadequate classroom use of technology, the U.S. Department of Education instituted a grant program in 1999 entitled Preparing Tomorrow's Teachers to Use Technology (PT3). This grant program addressed a growing challenge in modern education, the obvious inability for the majority of practicing teachers to understand and utilize technology in effective ways in their classrooms.

From 1999 to 2003, PT3 awarded over 400 grants to education consortia to help transform teacher preparation programs. PT3 grantees have developed models, tools, support and incentives to help faculty make the change to technology-infused teaching, both within schools of education and cross-departmentally across their campuses (www.pt3.org/). These grants include projects designed to transform teaching and learning through faculty development, course restructuring, certification policy changes, and online teacher preparation which include electronic portfolios, mentoring triads and embedded assessments. Federal, State, and local agencies have invested billions of dollars to equip schools with computers and modern communication networks, however, by the turn of the century, only one-third of our nation's teachers felt well prepared to use computers and the Internet in their teaching (Rowland, 2000).

Researchers found that preservice teachers' confidence level in using technology to teach was increased by their college teachers modeling technology in the college classroom (Pope, Hare & Howard, 2002). Even though the technology modeled by the college professors was at more fundamental levels of use (PowerPoint® presentations, word processing software, Internet lessons and multimedia software) the confidence level of the preservice teachers was significantly increased. It was also found that preservice teachers felt it was important to utilize technology in teaching, but only 20% of these preservice teachers actually felt prepared to integrate technology into the classroom (Pope et al., 2002).

How Faculty Best Learn to Model Technology Integration into Their Classrooms

There are several different ways of teaching faculty how to integrate technology into their classrooms. Some methods have met with great success while others with resistance. To find out which methods worked well and those that did not, the literature was consulted to find both barriers and recommendations to help in the process.

Barriers to Technology Utilization in the Classroom

There are several barriers to integrating technology into the classroom. The three most common barriers found in the literature are shared below.

Time

The lack of time has been cited as being a big deterrent to adopting new ways of delivering courses (Pryor and Bitter, 1995). Additional studies cite time as one of the biggest perceived barriers to technology integration: time to learn how to use the technology (Goodale, Carbonaro, & Snart, 2002), time to reflect and collaborate as well as plan new lessons based on the utilization of technology in the classroom (Carney, 1998). There is also a tendency by faculty to view technology as a time-eater rather than a time-saver until it has been mastered (Stuhlmann & Taylor, 1999).

Relative Advantage

A significant stumbling block for technology integration is faculty resistance. Innovations in education are frequently avoided if current methodologies appear to be serving their purposes and no real need for change is apparent (Pryor and Bitter, 1995). This phenomenon is identified as "relative advantage;" the degree to which an innovation is perceived as better than the idea it supersedes. Change is more likely to occur when people can relate the change to need (Rogers, 1995, p. 15). If they feel that the old way is better, they will be more likely to resist the new way.

Core Values

Another suggestion as to why teachers don't teach with technology in the classroom has to do with a struggle over core values. In Cuban's (1998) view, techno-enthusiasts tend to seek efficiency and student preparation for a computerized workplace while traditionalists are unconvinced that technology will produce more productive students or more literate and caring citizens.

Recommendations for Technology Acceptance and Integration

Recommendations for training acceptance and integration have been the outcome of several research projects. It is necessary to look at the many different methods that have been proven to work to get a good idea of commonalities across the board.

Rewards/Incentives

According to Brown (2000), recognition should be given to teacher education faculty who develop teaching strategies that include innovative uses of technology for authentic problem-solving and higher level learning. It is also recommended that administrators should provide the time and resources needed for developing instructional strategies that ensure this type of learning. Additional key elements that should be considered when designing and implementing professional development programs for educators are additional incentives in the form of play and discovery time, flexibility, on-site learning, and activity-based emphasis (Jenson, Lewis & Smith, 2002).

Ownership

Changes in technology usage occurred more rapidly and met less resistance when faculty members felt that they were a part of the decision making process (Drazodowski, Holodick, & Scappaticci, 1996). To illustrate this point, the goal of the Vanguard for Learning project, funded by the National Science Foundation, was to help a school community build their own capacity for innovation, and feed back the lessons learned to the larger school system. A central organizing structure of the Vanguard for Learning project is the Team Action Project (TAP). TAP is a structure for initiating, organizing, planning, implementing, evaluating, and communicating new ways of teaching, assessing, learning, collaborating, building knowledge, and organizing schoolwork. The basic premise of the Vanguard TAP structure and strategies is that a small group of teachers form a project based on the fact that they share a common vision for how to improve learning and teaching of their students. The teachers own their project and share in its creation and execution (Hunter, 2001).

To further illustrate the importance of faculty ownership of technology decisions, researchers formed faculty advisory groups and used a Delphi survey of twenty-nine faculty senate leaders to learn about how faculty should be involved in planning for the use of instructional and administrative technologies. These twenty-nine faculty leaders identified thirty-seven methods and techniques through which faculty should be involved in planning for the use of instructional and administrative technologies in higher education. They found, through their Delphi study, that faculty has very little say in the decisions about what technology is to be used in education. The participants in the study indicated they believe faculty should be involved in many aspects of both administrative and instructional technology planning. They strongly agree that the faculty senate should have a standing technology body and that faculty involvement should be at the ground level where planning procedures and initiatives are established. This would give faculty an opportunity to have some input on technology planning that is going to affect their institution and, in turn, their instructional practices. At the very least, if faculty is not involved in the decision-making process regarding technology, they need to be aware of impending changes. The participants in this study agreed that one way to accomplish this is that faculty should be made aware of technology plans by creating an advisory board of faculty to which administrators must report (Rice & Miller, 2001).

Strategies for Training

Research shows that technology can not be integrated into the curriculum without faculty first accepting it. Many sites under study tried a variety of strategies to overcome faculty resistance and gain acceptance. Three of the more successful strategies were: working one-on-one with resistant faculty, conducting many inservice programs, and using graduate students as technical resources (Pryor & Bitter, 1995).

In her chapter on strategies for development of technology in education, Davis (1997) discusses professional development strategies formulated around Project INTENT which targeted improving the use of technology in initial teacher education. The team of four at the University of Exeter agreed that the first and most common strategy for professional development was informal discussions and conversations (p. 256). She goes on to state that through these informal discussions, social context was developed and those of the team who had limited knowledge of what technology could do for them were able to draw on the knowledge of others on the team (p. 257). Seventeen different strategies for staff development with information technology are described. The five main modes of staff development transmittal suggested are meetings, workshops, demonstrations, one-on-one consultations and spontaneous support. Team teaching and indirect staff development are also mentioned as ways for the instructor to work in tandem with either a staff developer or students who may want to try approaches different than those with which the instructor is familiar (p. 262).

Davis (1997) also studied how teachers effectively integrate technology into their classrooms. As the participants in her study examined the data to find any unexpected or surprising outcomes, they found the most effective way of analyzing the data was for three or four teachers to meet together to examine a piece of data. They would spend a short time highlighting what they saw as significant and then would follow up with a group discussion. This type of session usually generated a very high quality of professional debate about teaching and learning (pg. 121).

Technology Tools Versus Pedagogy

Often in a school having a large infusion of computers and networks there is a tendency to focus professional development, or training, on the technology itself. Many teachers and teacher trainers believe that the teachers must master the technologies before they can engage their students in innovative practices. In contrast, the Team Action Project (TAP) process mentioned above starts with the teachers' vision of what students might be able to do and learn under new conditions of learning and teaching. Most of the TAPs in Hunter's study kept their focus on students, parents, curriculum, and pedagogy, and introduced technology applications as they were needed and available to support the pedagogical changes. They learned with their students. They provided their students with opportunities to exhibit their work to others. The TAPs that kept this student focus made much more rapid progress than the TAPs that had a predominantly technology focus (Hunter, 2001).

Very often the tools of technology take on greater importance than the ways in which these tools are used in providing education to students. Sixty-six faculty and graduate teaching assistants responded to questions about their self-reported knowledge and use of technology, factors influencing their use of technology, and perceived barriers to use of technology. The highest-rated knowledge of technology was with knowledge of technology 'tools' such as word processors, spreadsheets, e-mail, presentation software, and use of the Internet. The majority of the faculty and teaching assistants were most comfortable using more familiar technology such as word processing and less comfortable using 'new' technologies such as multimedia, distance learning, and computer aided instruction (Groves and Zemel, 2000).

A survey was developed from the National Educational Technology Standards for Teachers (NETS•T) committee designations of General Preparation Profile for Prospective Teachers which was designed to assess whether or not preservice teachers are ready to use technology in the classroom. This self-appraisal instrument proved to be statistically robust and worthy of wide-scale use. Through its use, preservice teachers can determine areas of weakness in technology knowledge and abilities to effectively incorporate it in their curriculum. Questions on technology literacy, pedagogy, experience, and training are included in the seventeen-point questionnaire (Knezek, Christensen, Morales & Overall, 2003).

Change Theory

It is well known from the psychological and sociological literature that any kind of change, in general, is very difficult for humans. Whenever routine is altered, stress is introduced and biological as well as mental stresses occur as a result. This is true for all aspects of daily life. Change to education with the introduction of technology into the curriculum is no exception.

Through extensive research on diffusion of innovation change theory, Rogers (1995) has provided a way to categorize people who are in the process of adopting a new skill or concept. The global characteristics of these categories he has outlined are Innovator, Early Adopter, Early Majority, Late Majority, and Laggards. Early Adopters adopt change readily and find ways to use the innovation in their particular field of expertise. They will spend great amounts of time developing uses for an innovation without regard to time spent or impact on the students. Faculty members who are Early Majority or Late Majority adopters are more deliberate with respect to adopting changes in their teaching and more skeptical of committing to the effort involved in bringing technology to their instructional practices. To be successful, techniques for training must move beyond trialability and incorporate several other attributes of the innovation diffusion process: *compatibility, observability, relative advantage, and complexity* (Rogers, 1995).

Drawing on this theory, simple questions can be asked to determine how readily an innovation might be accepted by a community. These questions are: 1. How well does the innovation fit the overall mission of the organization (Compatibility)? 2. Can outsiders see a positive change because of the innovation (Observability)? 3. Is adopting an innovation providing better outcomes than staying with the *status quo* (Relative Advantage)? and 4. Is the innovation too difficult or complicated to master (Complexity)? (Rogers, 1995).

Jacobsen (2000) profiled individuals who were both Early Adopters of instructional technology and excellent teachers. She found that there is a relationship between early adoption, motivation, and excellent teaching. She also found that the prevailing attitude for Early Adopters is to apply technology in their teaching, because it is the solution to his or her problem, not a solution looking for a problem. Also, Early Adopters appear to regard technology knowledge and skills as one type of expertise, and pedagogical skills as another type of expertise. Some Early Adopters cringe at the awkward and ineffective uses of technology by their peers, and are convinced that technology cannot improve poor teaching.

Another change theory, the Concerns-Based Adoption Model (CBAM), suggests that individuals move through several stages as innovations in education are adopted. These stages are awareness, acceptance, increasing comfort, and impact on the curriculum (Hall & Hord, 2001). Seven Stages of Concern have been identified through which people move with an innovation, eight Levels of Use which describe how an individual may choose to use the innovation, and a myriad of Innovation Configurations that modify how involved an individual might become with an innovation. These principles are designed to help leaders understand where individual concerns and levels of use concerning an innovation are grounded to help modify behavior towards acceptance and growth. Not all individuals follow through all Stages of Concern or Levels of Use or may never get to a point beyond a maintenance level. The ability to understand where people's concerns are in regard to an innovation is important in building greater advances in use and understanding (Hall and Hord, 2001).

What Other Colleges and Universities are Doing to Help Their Faculties Learn How to Model Technology Integration in Their Classrooms

Looking at what others are doing in the field of faculty and professional development can be very helpful in deciding what might work for training in a given situation. Research on different models of training and faculty development with technology has been performed extensively over the past twenty years, but the greatest strides in research on the integration of technology in the classroom have been in just the past few years. Consequently, this search is limited to that time-frame. Technology has been available to schools since the late 1970s and early 1980s but was not really useful to classroom education until the early 1990s.

In 1994 only thirty-five percent of the public schools in the United States were connected to the Internet, but by the fall of 2000 that number had risen to ninety-eight percent (NCES, 2001). In 1999, sixty-six percent of the teachers interviewed for the Education Statistics Quarterly said they were either not prepared at all or only somewhat prepared to use technology in the classroom (Rowand, 2000).

Most of the following initiatives featured in this review are of institutions involved in PT3 grants and developing different ways to approach faculty development. Even though faculty development is not the only initiative being funded by PT3, these examples are brought together to help support this study.

Rewards

Sometimes providing incentives to faculty who participate in faculty development offerings is a means of getting them to come. Recognition in some form should be given to faculty who develop teaching strategies that would include innovative uses of technology for authentic problem solving and higher-level learning (Brown, n.d.). Teachers were found to be reluctant to change their old ways of doing things in the classroom, see technology as a time-consuming activity that takes them away from other perceived high-priority obligations, have difficulty seeing the potential payoff or may feel threatened by technology. Rewards are suggested in the form of authorized and credible certification with grade and salary impacts, public recognition and time allocation by supervisors, reduced isolation, and a chance to become a trainer. These rewards are all motivators that help faculty learn and use technology in the classroom (Verma & Singh, 2003).

The University of Houston at Clear Lake has devised an incentive for faculty who attend faculty development workshop training sessions. They give five megabytes of dedicated server storage for each participant that has attended each of the three main sessions. This would give a total of fifteen megabytes of additional storage for each faculty member that has attended all three sessions (Crawford & Ley, 2002). It would seem that this incentive is good only if the faculty member is willing to use technology in the first place.

Time and money are strong incentives for faculty to learn how to utilize technology in their coursework. Being paid to participate in a grant required the faculty to set aside time to explore and integrate technology into their teaching. Without the incentive, they would have found other uses for their time. With the money incentive they felt obligated to work at utilizing technology (Sibbett and Stokes, 2003).

Technology Course for Preservice Teachers

Some institutions have developed a core technology course for their preservice teachers focused on the use of technology across the curriculum and are pleased with the results they are getting with their students (Brush, 1998). In 1997, one hundred sixty-four teacher preparation programs located in fourteen states in the Southeast as well as Puerto Rico and the Virgin Islands were surveyed to gather information on the role of technology in preservice teacher education programs. The majority (83%) of the respondents felt their candidates had the ability to operate computer systems but were weak in integrating technology into the curriculum. One finding was that a required technology course is more common than having technology integrated throughout the preservice teacher education programs (SEIRTEC, 1997). A survey of over eighty college and university teacher preparation programs provided a majority of the respondents (73%) reporting that a specific introductory instructional technology course was offered at their institution and was the dominant model for technology preparation of preservice teachers. Most of the respondents reported that computer technology was the main focus of these introductory courses. These courses taught about hardware, computer-based instruction software (e.g., simulations, tutorials and educational games), tool software (e.g., word processing, graphics/drawing applications, and desktop publishing), telecommunications (e.g., e-mail, Internet, and Local Area Networks), and programming (predominately LOGO) (Hargrave & Hsu, 2000).

Positive aspects of a single-course method of technology preparation are that it is easy to count for faculty load, it is easy for students to enroll and complete, and accomplishment is readily visible from a student transcript. Negative aspects include poor integration of technology into subject matter, inattention to individual technology knowledge differences, and short-term exposure to technology. Students also tend to view technology as another subject like math or social studies, rather than a general learning and teaching tool (Gillingham & Topper, 1999).

Modeling

Modeling technology is what needs to happen in the preservice classroom for preservice teachers to become accustomed to seeing technology being used by their teachers for instruction. A technology course at the University of Victoria in British Columbia, Canada has, as its main goal, to provide students with a model of how to teach elementary science, math, and social studies curriculum with technology rather than just how to use technology. The content of the course includes the use of computers for discovery learning, experimentation, simulation and modeling, forming and testing conjectures, problem solving, decision making, computation and data processing, as well as communication, information retrieval, and course management (Francis-Pelton, Farragher, & Riecken, 2000).

At the Shoreline Teacher Development Center (STDC) operating through the University of Washington's College of Education, they have a preservice teaching program located in a middle school providing opportunities for preservice teachers to see operational illustrations of constructivism supported by technology in real classrooms. The preservice teachers and their professors have actual direct experience with new practices happening at the middle school (Carney, 1998). This is an example of learning through modeling where the modeling is taking place concurrently for the professors as well as the preservice teachers.

In Europe, distance-learning communication technologies have been employed to allow faculty to model technology by using videoconferencing and/or the World Wide Web to demonstrate or model the use of technology to preservice teacher educators. Another use of this distance-learning communication technology is to educate the "teacher trainers" or university faculty in the use of technology in their teaching. Through this multi-national project, educators have learned how to model technology to the preservice teachers and promote a practice of lifelong learning (Davis & Prosser, 1999).

Mentoring

Chuang, Thompson & Schmidt (2003) identify several types of mentoring models which incorporate numerous different methods of training faculty in the use of technology for classroom use. In some mentoring situations, graduate students are used as mentors and most are part of a graduate class, undergraduate students are used as mentors in two-way or reciprocal mentoring situations, students are hired to help as mentors, or more technologically-advanced teachers participate in peer-to-peer mentoring situations. In most cases mentoring to teach how to use technology in the classroom is generally accomplished by utilizing a younger adult as mentor and the faculty member as the mentee. Many times the mentoring is reciprocal in nature. The learning transfers both ways because faculty members learn technology from the mentoring graduate students and the students learn pedagogy from the faculty members.

Even though mentoring models can be different, six distinct themes in almost all mentoring programs have been identified. They are: 1. providing visions for the use of technology and learning, 2. individualizing technology support and training, 3. breaking down hierarchical structure, 4. establishing open dialogue and collaborative relationships, 5. providing mutual benefits for mentors and mentees, and 6. establishing learning communities (Chuang et al., 2003). Some examples of different types of mentoring found at different colleges and universities follow.

At Iowa State University, a reciprocal mentoring model has evolved over the past decade which utilizes graduate students as mentors paired with willing faculty. The students participate in a graduate course, "Technology and Teacher Education," in which they discuss pedagogical thoughts and possible solutions to helping their mentees, as well as sharing mentoring experiences. Participating faculty are paired with one of these graduate students and they spend approximately one hour per week during the semester working on technology-related learning tasks (Stewart, 1999; Zachariades & Roberts, 1995).

George Mason University modeled a pilot mentoring program after Iowa State's and offered a similar course to its graduate students titled "Faculty Development in Instructional

Technology" (Sprague, Kopfman & Dorsey, 1998). One difference from Iowa State's program is that they interviewed both students and faculty to pair each team by matching students' technology abilities and the faculty members' desired skills. The course was not mandatory to the program and the first attempt produced only eight students to mentor a faculty volunteer pool of twelve teachers. Within the first semester this model was attempted, the faculty improved their technology skills, most notably in the use of e-mail and conducting online searches (Sprague et al., 1998).

New Mexico State University introduced a mentoring opportunity by offering graduate credit through an internship program to five selected students. These students were paired with five volunteer faculty members by areas of interest and technology expertise, similar to George Mason University. The graduate students met with the project director every two weeks to discuss problems, solutions and to share experiences (Gonzales, Hill, Leon, Orrantia, Sexton, & Sujo de Montes, 1997, Gonzales & Thompson, 1998).

Also utilizing graduate students, Pepperdine University pairs students in the Online Masters in Educational Technology (OMET) program with faculty to help work on educational technology projects of interest to the faculty member. These projects are for one semester (Tally, n.d.).

Instead of utilizing a course in mentoring or technology enhancement, a program at the University of Houston has actually hired graduate students to be mentors to faculty members. Student technology team members, called Technology Fellows, are assigned to at least one professor to assist with integrating technology into their curriculum (Bump & McGhie, 2002).

At the University of Northern Colorado, educational technology graduate students mentor teacher education and arts and science faculty members on the redesign of courses to model appropriate uses of technology. Faculty members are released from teaching one class in exchange for their participation in the mentoring project (Caffarella, n.d.).

Colleges without graduate programs in technology have used undergraduate students as mentors encouraging them to develop skills with technology and to become "experts" and budding trainers. Besides alleviating the faculty's need for technology help, the students gain training experience to add to their résumé. Two colleges that have utilized undergraduate students as trainers and mentors are Carson-Newman College (Milligan & Robinson, 2000), and the University of Regina (Browne, Maeers & Cooper, 2000). Texas A&M University also utilizes their undergraduate students as mentors for faculty through their Technology Mentor Fellowship Program. Technology-savvy undergraduates are trained to coach core faculty members in using technology. The faculty then utilizes the technology to model examples of ways to integrate it into the curriculum (Clark, n.d.).

Fresno Pacific University and George Mason University utilize K-12 teachers to mentor college faculty in classroom technology methods (Bese, n.d.; Sprague, n.d.). The mentoring program at the University of Minnesota utilizes "Technology Integration Fellows" as mentors for the teaching faculty at the university. These Fellows are local K-12 inservice teachers who are granted a one-year leave from their districts to work full time with two or three faculty members throughout the course of the academic year to help brainstorm ideas, plan lessons, prepare presentations and work one-on-one to develop technology integration into the teacher education classroom (Dexter, n.d.). This model of mentoring would be difficult for school districts that cannot afford to release faculty members for a leave of absence.

St. Joseph College uses a peer mentoring approach using a faculty member to act as a mentor to several other members of the faculty. They instigated several one-half hour one-on-one training sessions for individualized support based on the needs expressed by faculty. They were of the opinion that only faculty members can be mentors because of the specialized knowledge they would have and to be closely related to the academic mission (Chatel, 2002).

One-on-One Training

One-on-one training closely mimics mentoring, however, the trainer is not matched with just one or two faculty members for training. The training is customized for each individual professor and usually offered when he or she needs to learn a specific task.

Texas Tech University utilized a one-on-one approach to faculty development to help faculty learn how to use technology as "just another tool like a chalkboard." They emphasized that "technology is a tool, not something extra that you teach." The faculty development trainer provided individual one-on-one assistance to early-adopters and tailored each program individually for each professor based on needs and desires. Cooper (n.d.) notes that this one-on-one training is very intensive and time-consuming.

At the University of Houston, faculty members were interviewed for subject matter and subject style, along with technology interests and visions of technology integration. A PT3 grant team member was matched with each interested faculty member to promote a collaborative and consistent relationship with the grant team. These teams looked carefully at technology currently utilized in existing courses and worked collaboratively, one-on-one, to develop more structured and purposeful technology usage in the classroom. They also used collaborative lunchtime "brownbag" opportunities to discuss progress between teams (Smith, Adams, Fillip, & Smith, 2002).

Workshops

The attraction of workshops over one-on-one training for the trainer is that they take much less time to deliver information to several participants all at once instead of having private sessions individually. However, Davis, Kirkman, Tearle, Taylor, & Wright (1996) found that providing short courses or workshops to faculty had limited outcomes in terms of faculty continuing to use the technology just learned. They see the limitations as being a result of the shortness of the training each individual receives, the difficulty of arranging time to develop the skills necessary to use the technology, and the relevance to each individual.

At the University of North Florida, the faculty opted to have weekly workshops on Friday afternoons when there were no competing demands on time such as teaching or committee meetings. They met to learn the most-requested skills in small groups in a relaxed and interactive atmosphere led in project-oriented learning by a colleague. According to Cavanaugh (2002), these workshops helped to build awareness of available technologies and foster community building between the participants.

Cellante (2002) described the faculty workshops that were offered at Robert Morris University to address issues including operating the various types of classroom presentation tools, their e-mail system, grade submission, adult pedagogy, on-line education, and application software. These workshops were then followed up with documentation and suggestions on how to use the technology effectively in the everyday classroom.

At the University of Alberta, faculty members were invited to several scheduled "bring your own projects" workshops. The faculty designed its own faculty development program at workshops that were hands-on and interactive. They kept the group sizes small and relied on peers to teach each other about technology and to help fix problems. Even with the workshops, they expected very specific follow-up from technical experts after the workshops to see how they were progressing (Goodale et al., 2002).

As one of their multiple approaches to faculty development, faculty workshops at the University of Florida were divided into individual modules rather than organized step-wise progressive instruction. Workshop participants were given the opportunity to have input toward the objectives of the workshops making each workshop content-specific for the faculty in attendance. These workshops were enhanced with online support in the form of Adobe™ Acrobat® PDF downloads and tutorials along with Frequently-Asked-Questions. They then augmented these workshops with one-on-one training for each faculty member who requested further training on specific subjects. The consultants for this one-on-one training were students and the training took place in the professor's office at the professor's computer (Ring, Cilesiz, Ali, & Chen, 2002).

The University of Houston at Clear Lake instituted a package of workshop arrangements whereby they offered large basic workshops on specific topics, then offered smaller workshops for novices and advanced users depending on skill and comfort levels. One-on-one, face-to-face meetings were then scheduled with individual faculty members to fine-tune their developing skills. Troubleshooting, training, and support were subsequently provided as an on-call service. Ongoing online support was available in the form of tutorials and discussion lists (Crawford & Ley, 2002).

Purdue University had a weeklong series of summer workshops designed to immerse faculty in real-life challenges that could be addressed by using technology. They then followed up in the fall with drop-in help sessions and "Techie Talk" sessions designed as lunchtime "brownbag" discussion meetings. Then, one-on-one follow-up was provided to help strengthen the knowledge base of the faculty (Lehman, n.d.).

"Geek Week" was a weeklong intensive workshop offered by Washington State University designed to give faculty members a chance to work with new technologies and new teaching methods in a collegial and supportive atmosphere. In addition to faculty, graduate students were also invited to the event. They offered thirteen different workshops at different times during the week in much the same way as a conference or convention would provide breakout sessions. The facilitators of each week-long session were expert or "super-user" level technologists (Brown, n.d.).

Other Strategies

At the University of Technology in Sydney Australia, the faculty initiated an instructional technology reading program. It was similar to a literary book club with an instructional technology twist. Interested faculty members read selected papers on classroom technology integration one week prior to their monthly discussion meeting. This allowed the participants to reflect on and raise issues about the use of technology in their teaching and to discuss these in an intellectual manner, supporting arguments from a research basis (Schuck, 2002).

An example of what several universities are doing to offer training that is available anytime, any place is offered by the New York Institute of Technology (NYIT). NYIT began a program of online training using Macromedia™ Flash® 5 and Fireworks® 4 over the Internet using Macromedia™ Dreamweaver® 4 to design the site. This allowed faculty to access training any time of the day or night as their time permitted. Their preliminary results were quite positive with a high level of satisfaction with the use of online technology to assist faculty in learning technology (Uttendorfer, 2002).

Michigan State University had a unique approach to faculty development using "Design Communities." These Design Communities were structured to make the faculty members the designers, creating their own teaching environments, bringing the tough issues they face to them. Teaching assistants and other graduate students then worked with the faculty members to come up with technology solutions. They started with, and respected, their faculty's needs (Zhao, n.d.).

The University of Missouri at St. Louis also started with their faculty's needs but had each faculty member sign a contract outlining the technology they were committed to learn. After completing a needs-assessment, each faculty member was interviewed individually and a "menu" of skills courses, workshops, or sessions was presented to the faculty member based on perceived needs and desires for outcomes in their classrooms. They then signed the contract and began training, which was scheduled by the training facility staff and coordinated with others needing the same type of training and schedules. Training took place in their faculty development center which had several different "coves," "pods," and "clusters" designed for different size groups or technology needs (Mastin, n.d.).

Similar to the University of Missouri at St. Louis, Belmont University had a specialized way to integrate technology into the classroom. During private interviews with the technology specialist, each professor developed a list of personal technology strengths and weaknesses based upon a self-assessment tool, determined which technology skills were already included or taught in their courses, developed strategies to initially or further integrate technology into their courses, and identified special training and/or resources needed to successfully integrate the technology. They then received this training by team-teaching with the education technology professor. They then converted the technology assignments in selected courses to the World Wide Web using online course management software (Breegle & Stamper, 2002).

Conclusions

Findings throughout the literature stress the need for Higher Education faculty across all disciplines to learn how to use technology in their classrooms and to model this technology for students (Mullen, 2001). Technology integration modeling is needed but lacking in preservice education classrooms (Albee, 2003). Preservice teachers know how to use technology to prepare for classes but are still uncomfortable using technology for educational purposes (Rowland, 2000).

There are barriers that keep higher education faculty from learning how to utilize technology. The most formidable barrier is time (Goodale et al., 2002). Educators also need to see some relative advantage to using technology in the classroom before extensive changes are likely to occur (Rogers, 1995). Core values play a big part in the life of a school and need to be addressed, understood, and dealt with before any real growth can occur (Cuban, 1998).

The single-course method of training preservice teachers how to use technology is useful in training them how to use the hardware and how to select and use software appropriate for grade level (Brush, 1998). However, it is not enough to just know the mechanics of technology. It is also important to teach preservice teachers how to incorporate technology into their curriculum and many times these single technology courses do not do this (Hargrave & Hsu, 2000). These teachers-in-training need to witness technology being used daily in their own classes as they learn how to be teachers (Francis-Pelton et al., 2000). Preservice teacher educators need to model technology integration in their classrooms to help this change happen.

If educators think that technology is inherently bad for education then change toward using it for instruction will be resisted (Cuban, 1998). Recommendations for helping faculty to accept technology into their curriculum are rewards and incentives, a sense of ownership for the faculty and special training strategies such as one-on-one instruction, many training sessions, and utilizing students to help train faculty (Hunter, 2001).

Change theory plays a big role in the acceptance of technology into the mainstream of educational classroom use. If individuals are not ready to accept change then change will not happen (Hall & Hord, 2001). Persons in training positions need to be aware of people's Stages of Concern and Levels of Use toward technology integration before they can even help individuals progress to higher stages or levels.

Colleges and universities are using many different methods to help bring about staff development in the area of technology integration. Strategies that tend to be helpful in getting the training to the teachers include modeling (Carney, 1998), mentoring (Chuang et al., 2003), and workshops (Cavanaugh, 2002). As found in the literature on faculty development and modeling technology integration into the classroom, there are many different ways that have been tried to help bring about successful technology training. One-on-one instruction seems to be the best way to deliver technology instruction whether through a mentoring situation or by the technology consultant (Smith et al., 2002).

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Cycles of Action Research in Faculty Development to Help Preservice Educators Model the Integration of Technology in the Classroom

A paper to be submitted to College and University Media Review

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Abstract

Participatory action research was employed for this study to help determine effective tools designed to help preservice educators model technology in their curriculum. Transcribed interviews, team meetings and reflective journals served as data collection points for the study. Individualized training was made available to enhance the technology literacy of the participants providing insights of best ways to offer this training. Through the cyclical nature of action research, the tools that were found to work best for our group in the delivery of this training were one-on-two mentoring sessions, specially designed instructional "cheat sheets," and bi-weekly collaborative meetings. These tools and the story of how the group came to the determination of their usefulness in our situation are shared. Research and observations on the importance of preservice educators modeling technology in the classroom are shared and discussed.

Introduction

Due to increased technology in the hands of students, teachers, and our culture as a whole, there is a need for higher education faculty to learn how to use technology in their classrooms and to model this technology for students (Mullen, 2001). Although it is beneficial that preservice teachers should have technology modeled for them while they are learning how to become good teachers, this modeling is lacking in preservice education classrooms (Albee, 2003). Research has also established that preservice teachers are literate with and know how to use technology to prepare for classes in a teacher-centered way but are still uncomfortable using technology for student-centered curriculum (Rowland, 2000).

Some barriers that keep higher education faculty from learning how to utilize technology are time (Goodale, Carbonaro, & Snart, 2002), a sense of relative advantage

(Rogers, 1995) and core values (Cuban, 1998). These barriers need to be overcome in order to bring about a change in the way preservice teachers learn how to teach. Also, the change from conventional teacher-centered curriculum to using technology to enhance education may be resisted if educators think that technology is inherently bad for education (Cuban, 1998). Removal of these barriers can sometimes be accomplished by offering the faculty rewards and incentives and by helping to build a sense of ownership of technology utilization. Also, offering special training strategies such as one-on-one instruction, group workshops, and individual mentoring using technology-savvy students to assist faculty can be effective in removing barriers that keep faculty from learning how to utilize technology in their classroom curriculum (Hunter, 2001).

Individuals must be ready to accept change for change to happen. Change theory informs the acceptance of technology into mainstream education. Educational Trainers aware of people's Stages of Concern and Levels of Use toward technology integration can help use it to them progress to higher stages or levels (Hall & Hord, 2001). While it is important to be aware of people's readiness to accept change, not everyone will go through the same Stages of Concern or Levels of Use at the same rate or even ever reach some of the more advanced levels before moving on to a different innovation.

Strategies being used at different colleges and universities that are designed to encourage classroom technology use include modeling (Carney, 1998), mentoring (Chuang, Thompson, & Schmidt, 2002), and workshops (Cavanaugh, 2002). These methods of training are useful to bring about awareness and skill development. One-on-one instruction has been identified as the most effective way to deliver technology instruction either through a mentoring situation or with the technology consultant or expert providing training at the point of need but it is also the most time-consuming (Smith, Adams, Fillip, & Smith, 2002).

Although the single-course method of training preservice teachers how to use technology is useful for technology literacy (Brush, 1998), it does not necessarily teach preservice teachers how to use technology pedagogically in their curriculum. These single technology courses teach literacy only (Hargrave & Hsu, 2000). Preservice teachers need to observe technology being modeled daily in their classes as they learn how to be educators (Francis-Pelton, Farragher, & Riecken, 2000). It was found that preservice teachers' confidence level in using technology to teach was increased when their college teachers modeled technology in the college classroom. It was also found that preservice teachers felt it was important to utilize technology in teaching. However, only 20% of these preservice teachers actually felt prepared to integrate technology into the classroom (Pope, Hare & Howard, 2002). These preservice teachers are still not being reached. Teachers become university professors and teach the way they had been taught (Myers, Miels & Ford, 1997) and model a traditional teaching approach to their students who, in turn, model their professors (Groves & Zemel, 2000).

How can this cycle be broken? Preservice educators need to learn how to be better modelers of technology in their teaching so that their students can learn by example and emulate their instructors (Thompson, Bull & Willis, 1998). This is the point of greatest impact. These preservice educators, over the course of their teaching careers, will train hundreds, if not thousands, of students to be teachers. If they can model effective technology use in their teaching, their students will tend to emulate them when they begin to teach in their own classrooms (Rice & Miller, 2001).

To accomplish this change, opportunities should be provided to higher education faculty to help them find pedagogically effective ways to use technology. Better methods need to be devised to deliver technology instruction to the faculty to help them discover how they can utilize technology in their courses; not just teaching them the tools of technology but making the use of technology in the classroom pedagogically sound as well (Willis, 2001). In so doing, preservice teachers will be exposed to the modeling of this technology in their daily coursework, become more comfortable using it as an instructional tool, and become more adept at integrating technology in their classrooms.

The Problem

As the Director of Instructional Technology Services for a small, rural, Midwestern, liberal-arts university, my job is to find effective ways to train our faculty to become better modelers of technology integration in their classrooms. My training department consists of myself and six part-time undergraduate student workers serving approximately seventy full-time faculty plus several support staff. I also serve the audio/visual needs of our university. Many of the ways technology training had been delivered in the past has proven ineffective.

There was low attendance at workshops and lunchtime training sessions that had been previously offered. One-on-one training and mentoring sessions had proven to be more effective but were very time-consuming. While lack of time was the most frequent reason given for not taking advantage of training opportunities, locations and schedules for the training sessions also proved to be inconvenient for faculty. When training did take place, follow-up was sporadic and inefficient. Also, the workshops seemed to be predominately designed more for technology literacy than for developing pedagogy. Knowledge methods to multiply training efforts were needed and at the same time the faculty needed to experience some "relative advantage" to stimulate growth of their technology modeling. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. Change is more likely to occur when people can relate the change to need. If they feel that the old way is better, they will be more likely to resist the new way (Rogers, 1995, p. 15). One-on-one training had been most effective at our university but there was never enough time or resources to answer all the requests for individualized training.

The Proposed Solution

Within their seventeen strategies for staff development with Information Technology in teacher education, Davis, Kirkman, Tearle, Taylor, & Wright (1996) classify several strategies on how instructional technologists can be helpful to faculty members in their quest for technology integration. These strategies included: informal discussions and conversations, demonstrations by the staff developer to an individual or group, spontaneous support, provision of information to suit the colleague's personal interests or needs, and curriculum development or collaboration, which is often related to research. These strategies were found to be helpful in getting the faculty members to not only determine their own needs pertaining to technology integration, but also to share what works for them with their colleagues.

Research by Drazdowski, Holodick, & Scappaticci (1996) and also by Hunter (2001), provide evidence that faculty members are more likely to be responsive to training if they were the ones voicing their own technology training needs. Ernest Stringer, in his book "Action Research," also notes this more generally:

> When we try to get people to do anything, insist that they must or should do something, or try to stop them from engaging in some activity, we are working from an authoritative position that is likely to generate resistance. Such situations often are characterized by processes in which people in positions of authority already have defined the problem and formulated a solution. They fail to grasp that others may interpret the situation and/or the significance of the problem in ways different from their own or may have different agendas in their lives, with other matters having much higher priority. My [Stringer's] experience suggests that programs and projects begun on the basis of the decisions and definitions of authority figures have a high probability of failure. (Stringer, 1999, p. 47)

I reviewed the literature to find technology faculty development strategies that were working in other colleges and universities and found several that I thought would lend themselves as part of the following workable solution for our university. To foster a program based on community-building and research instead of being authority-driven, an instructional technology research reading program would be offered drawn upon the approach taken at the University of Technology in Sydney, Australia (Schuck, 2002). The faculty members would then be encouraged to design and create their own teaching environments adopting a strategy similar to that of the "Design Communities" at Michigan State University (Zhao, n.d.). Once they determined the technology skills required in order to meet the pedagogical needs for their classrooms, their needs and interests would then be matched with one-on-one training similar to the individualized training offered at Texas Tech University (Cooper, n.d.). They would then be provided collaborative opportunities to discuss progress between teams (Smith et al., 2002).

Research Method

The particular model of Action Research chosen for this study was Participatory Action Research (PAR). PAR is not a research approach designed for only one researcher looking for a solution to a problem, but rather an approach for a team of researchers with similar concerns and interests searching for a common solution to a problem. PAR was utilized because of the need for the faculty members to have ownership of the project. PAR was a way for the faculty team to search for understanding in their places of practice and was a way for them to develop new and creative ways of looking at things in their practice. It was also a method for the faculty to find out how to do things more efficiently and how to change things they may want to change. The nature of action research allows for the continual feedback and re-adjustment of the research design in order to take advantage of currently-learned phenomena.

PAR is grounded in the belief that good research is research *with* people rather than *on* people. Researchers utilizing PAR believe that ordinary people are quite capable of developing their own ideas and can work together in co-operative inquiry groups to see if these ideas make sense in their practice and work world. PAR researchers, and action researchers in general, also believe that the outcome of good research is not just books and academic papers, but is also the creative action of people addressing matters that are important to them. The entire team contributes to the ideas that go into their work, has a say in deciding what questions are to be addressed, all get involved in the activity that is being researched and each has a voice in whatever conclusions the PAR group may reach.

I was the lead researcher for the team. Even though the whole team had a focus of learning how to use technology in the classroom more effectively, my particular focus was to facilitate shared ownership of the project and to find training methods that were effective in helping them to use that technology.

Table 2.1. Matrix of Proposed Data Collection

Fall Semester, 2002 - 16 Weeks									
Initial Interviews of AA, BB, and CC each one hour in length - transcribed	Team Meeting #1 - Week 1 one hour - transcribed	Team Meeting #2 - Week 3 one hour - transcribed	Team Meeting #3 - Week 5 one hour - transcribed	Team Meeting #4 - Week 7 one hour - transcribed	Team Meeting #5 - Week 9 one hour - transcribed	Team Meeting #6 - Week 11 one hour - transcribed	Team Meeting #7 - Week 13 one hour - transcribed	Team Meeting #8 - Week 15 one hour - transcribed	Exit Interviews of AA, BB, and CC each one hour in length - transcribed
	Individual and one-on-two training - 42 sessions								
	Reflective Journals from AA, BB, CC, and RE - 107 total entries								
	Collection of artifacts from AA, BB, CC, and RE - 47 artifacts collected								

A definite schedule was outlined and adhered to fairly closely over the sixteen-week semester (see Table 2.1). This schedule allowed us to learn new technologies, compare successes and failures, and gather data.

Validity

There are several ways to prove the validity of a study and to preserve the accuracy of the results. How valid is the evidence and how does it apply to others in different situations? Several measures were applied to assure the validity of this evidence. The study identifies models of faculty development in the area of technology integration modeling and some methods and tools participants believe may be useful at our institution for technology faculty development. They could prove helpful in other similar situations although caution will be required to interpret this case study in a new context. Below are some of the validity 'tools' used in an effort to make this study as reliable as possible.

Triangulation/Disconfirming Evidence: Triangulation is a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study. This was accomplished by comparing and contrasting statements of the three faculty team members to find some consistency and possible exceptions to themes or patterns (Denzin & Lincoln, 1994). Artifacts they produced were compared with what they described during team meetings, private training sessions, and their journal entries to validate what they were relating against their actions. Disconfirming evidence was also evaluated. Multiple sources of data, themes or threads were analyzed to identify contradictory evidence. Remarks made by participants in interviews were compared to individual reflective journals or transcribed team meetings. Some disconfirming evidence was found but it was rare. The most common disconfirmation were statements about the individual's inability or incompetence to use technology which was disproved through examples of their work or third-party observations.

Researcher Reflexivity: As the main researcher, I kept two researcher journals throughout the study which contributed to researcher reflexivity. A professional journal documenting impressions, feelings and discussions with team members and possible solutions to challenges was kept to help in keeping track of conversations and ideas for solutions to training. In addition, a personal journal was kept to be a release for frustrations with the study and toward team members during the study. Thoughts and musings of a personal nature were kept throughout the study that may have been inappropriate to share directly with the team members, but helped in sorting out some difficult feelings about the team members and the challenges the team faced.

Member Checking: For years, anthropologists and sociologists have incorporated a kind of member check by having an outsider read their field notes and interview transcripts. This method of member checking is useful for our purposes, for research on education is always open to the public (Janesick, 1994). Another researcher, not associated with this study, was asked to review the data set to determine if the interpretations were accurate. Data coding proved to be approximately 92 percent accurate based on the categories set up by the researcher.

Data Gathering

The data gathering for the study began the first week of the fall semester, 2002. A specific sequence and schedule was followed to help keep the study on track. The timetable did vary only by a day or two to accommodate individual emergencies and schedules (see Table 2.1).

Interviews: At the beginning of the 2002 fall semester, each of the three faculty members was interviewed individually to benchmark their attitudes and skill with technology. During the initial interviews each participant was asked questions that would help place them on a scale of how comfortable they were with technology and how they perceived themselves modeling it in their classrooms (Appendix B). Hall & Hord's (2001) description of their Concerns-Based Adoption Model (CBAM) was used as a benchmark scale. According to the CBAM principles, there are seven Stages of Concern (SoC) and eight Levels of Use (LoU) of an innovation. These stages and levels were helpful guides for placement of the participants.

Although Hall & Hord have specific questionnaires to administer to determine SoC and LoU, they are most useful in comparing a large number of participants involved in a new innovation. Since our study involved only three faculty participants, it was felt the SoC and LoU would be useful as guides to benchmark the participants but not as quantitative measures. The broad innovation addressed in our interviews was that of modeling technology integration in the classroom. Questions covered such things as technologies they were familiar with, which ones they currently used in the classroom and how comfortable they were with trying new ways of using technology in their classrooms. These benchmark assessments were based on individual perceptions and stated use in the initial interviews.

At the end of the semester, individual interviews were carried out for each of the faculty team members to conclude the data collection.

Team Meetings: A team meeting was held once every other week over a period of sixteen weeks for a total of eight meetings and lasted approximately one hour each. The team used the meeting time to collaborate, to commiserate, and to build awareness of what each was doing with technology in their separate classrooms so others might be inspired to use technology differently or in new ways on their own. Articles were shared from featured researchers dealing with utilizing technology in the classroom (For a reading list, see Appendix E). Also, some tools were demonstrated which were of interest to the team members based on comments they had made in previous meetings or conversations. Internet search engines were explored and portable equipment to be used on- and off-campus was demonstrated. Each of these team meetings was audio tape recorded, transcribed, and given to each of the team members to correct or to edit the content. None of the faculty participants ever made any changes to content in these transcriptions.

Reflective Journals: The team members agreed to keep reflective journals of their feelings and technology modeling experimentation and were asked to share in their journals how they felt about using technology in the classroom and the effectiveness of the one-on-one training sessions. They were encouraged to share what they were thinking about doing, what they had done, what was frustrating, what worked, and what did not work. Two of the participants began with reflections only on direct contact with the technology consultant in training situations. The instructions were clarified at the second team meeting and participants were quick to comply.

Team Member Training: As the instructional technology consultant, I conferred with and set up individual training sessions for each of the team members, one or two hours per week to train them in the use of technology to improve their teaching. These sessions were designed to help the team members become more adept at using and troubleshooting technology so they would feel more comfortable when modeling it in their classrooms. They reflected in their journals or discussed their feelings during our bi-weekly team meetings about what worked and what didn't work for them in the training sessions. This was the main focus of the study. I was searching for best ways to deliver technology instruction to help faculty members become more comfortable in modeling technology integration in their classrooms.

Artifacts: The team members were asked to collect and save any artifacts they created during the study such as PowerPoint® presentations, spreadsheets, and other documents which were then collected by me, the 'team leader.' These artifacts were used to help in triangulation and to assist in determining which type of training worked the most effectively with the team members. Although not of ultimate importance to the study, these artifacts helped in determining what types of training seemed to make the most impact. Of greater importance were the artifacts that the technology consultant designed to deliver training to these faculty members, and their further development following feedback. These artifacts were used to determine what types of instruction were most effective in their delivery and could be used to help lessen the need for live support for every technology task.

The Journey

Several events happened over the course of the sixteen-week semester that can be told chronologically helping to note the progress of the three faculty members in their pursuit of technology expertise. The metaphor of a journey has been chosen to communicate the progress that the participants, including myself, accomplished over that time period. As time progressed, everyone learned a little bit about themselves, their attitudes towards technology modeling, and how their cohorts could help them in their quest.

Description of Team Members – The Sample

The team members for the study were recruited from the School of Education to enable me to work with faculty who would have the most direct contact with preservice teachers. The sample chosen was representative with respect to the levels of technology usage across campus. I recruited one faculty member who uses WebCT® extensively in her classes and has had some one-on-one technology mentoring in the past. Her motivation to help in the study was to help improve her technology expertise and help to add to her own dissertation process. The other two recruits had less technology experience in teaching and were not far advanced in their abilities to use technology even for their own personal use. They were able to follow simple directions to accomplish technology tasks but did not have a vision of how to use it effectively in the classroom. The motivation for both of these individuals was to help me out with my dissertation process since they had recently gone through the process and wanted to be of help. Both of these participants wanted to improve their abilities to utilize technology but had little idea of where to begin. To offer a bit of anonymity for the three participants in the study, double letters were used to identify each team member. Throughout the study, in transcripts, notes and journals the team members were known simply as AA, BB, and CC and this is used to report in a later section of the paper.

Data collection began the first week of school during the fall semester of 2002 with the interview of each of the study participants. These individual interviews were completed prior to any team meeting or one-on-one training to establish a benchmark for each of the team members. The three participants were then categorized based on their personal concerns and levels of use pertaining to modeling technology in their classrooms. These Stages of Concern (SoC) and Levels of Use (LoU) were based on Hall & Hord's (2001) Concerns-Based Adoption Model (CBAM) discussed above.

AA had had five years experience at our University when she came into the study. She had spent several years in education. Her first years were in lower elementary, primarily as a kindergarten teacher, but she taught in all of the elementary grades, including 6^{th} grade. She then became a principal and worked in that capacity ten years in three small to medium sized schools. At our University she has taught every course the School of Education offers except for science and math methods. As a public school teacher she remembers using technology such as record players, 16 mm, slide, filmstrip and overhead projectors, the ditto machine and chalk. More recently, besides still using the overhead projector, she has used and is fairly comfortable with Microsoft Word®[i], PowerPoint®[ii], e-mail, CD player, VCR, the computer labs on campus, and the photocopier. She also is fairly competent with Inspiration®[iii], Hyperstudio®[iv], WebQuests®[v] and WebCT®[vi]. All of her courses have at least an assignment drop box in WebCT®. In some classes she uses more WebCT® tools such as discussion groups, chats and e-mail. She does not use the on-line testing function.

Serving her first year as a faculty member at our University, BB had taught several years in the public schools as well. She began her career as a home economics and art teacher at the high school level and incorporated early childhood into those classes. While her own children were young, she operated a daycare center in her home and became interested in special education when her infant son displayed both physical and learning disabilities. Her energies then focused on becoming a special education teacher, and she was most impressed with the overhead projector as a tool useful for students with disabilities. She felt she could retain eye contact with the students which particularly helped students with auditory difficulties. After teaching special education for several years she began teaching at the university level. Just prior to coming to our University she was the Director of Education for the Seminole Nation for two and a half years. At the beginning of this study she was fairly comfortable with the overhead projector, photocopier, e-mail, word processing, VCR, Internet searches, and spreadsheets. She was just learning how to use the data projector with her computer and the document camera. Currently, BB teaches educational psychology courses such as the educational psychology and measurement course, the assessment course and special education courses in the multi-categorical certificate program.

Table 2.2: Years experience at different levels

	preschool	elementary	middle school	senior high	public school administrator	college & university
AA		11			10	5
BB	9			2	5	7
CC			3	6	9	7

CC was beginning his second year with our University when the initial interview was performed. He had started out directly upon graduation from college as a substitute teacher in a very large school system in Southern California. His experience was mainly teaching middle school and high school social studies and coaching which he did for several years before serving as an administrator for a number of years in a large school district. He then became a principal for a Christian school. He has taught education classes with Pepperdine University and the University of Phoenix and still continues to teach as an adjunct for

Pepperdine. Currently, he teaches introduction to education, classroom management and legal applicable pedagogical courses. In the graduate program he teaches an historical/philosophical foundations course and a topics course. He is most comfortable with using technology such as the overhead projector, CD player, photocopier, e-mail, Microsoft™ Word®, VCR, Internet searches, and the computer labs. He has had very little experience with PowerPoint® or Excel® and had no understanding of things such as file management or e-mail distribution lists. While performing repetitive technology functions with little difficulty, he had trouble with tasks that were not repeated often or recently. He was willing to learn how to use technology in his classroom but could not see any relative advantage for him to utilize it unless he could have enough technology for all of his students. In his classroom he resists using technology with which to lecture and prefers to use the more traditional overhead projector and chalkboard. His reasoning was that technology has a way of failing and he did not have the skills to troubleshoot problems and when it came to class time, he did not want to waste students' time or his in trying to solve technical problems when there was no tech person available. It also made him "lose some credibility" with his students when he didn't know how to do something (CC in Team Meeting #4, 10/29/2002).

As an overview, all three like to use video clips from VCR tape to illustrate points. Two team members commented that they use music to set a mood, either upbeat or settling,

Table 2.3: Types of technology currently used for course delivery

	Overhead Projector	photocopier	e-mail	word processing	VCR	Internet searches	computer labs	CD Player	background music	telephone (including cell phones)	graphics programs	Inspiration	PowerPoint	HyperStudio	WebQuest	Web course management software	document camera	data projector	spreadsheet
AA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
BB	X	X	X	X	X	X											X	X	X
CC	X	X	X	X	X	X	X	X	X										

in the classroom. Two of the team had started using technology in their teaching as far back as thirty years ago such as ditto machines, record players, 16 mm film, filmstrip, slide, overhead, and opaque projectors. Some of the newer technologies all three currently use in course preparation and delivery are the Internet, computers, printers, photocopier, CD players, CD burners, projection devices, DVD, VCR, and telephones; especially cell phones.

Every one of them defined technology as being more than just computers. They held to some of the more trustworthy technologies such as the telephone, TV/VCR and photocopier as being some of the most useful tools in education today. However, one stated she did not think she could live without e-mail as a tool in her repertoire (see Table 2.3).

At the beginning of the study, all three participants were familiar with and used the word processor to create handouts for their students. They also used the photocopier extensively for making information available to students. The difference in grade recording was interesting; one recorded grades manually in a Word® document, one on a spreadsheet and the third in the online course management system, WebCT®. When asking the one participant why grades were kept on a word processing document the response was, "I never learned [how to use] a spreadsheet…I haven't had the time to go learn it when it's offered" (Personal communication with CC, 10/31/2002). The same individual also had never learned how to create folders or how to file documents according to subject or area of interest.

One of the questions asked in the interviews dealt with what modeling technology meant to them. Most of the responses dealt with providing a demonstration to their students in preparation for an assignment. The first team member to be interviewed saw modeling technology as thinking about "…using things with my students that they can, in turn, take and use with their students" (Initial Interview of AA, 9/10/2002). Modeling software tools such as Inspiration®, PowerPoint®, and WebQuest® to students was an important way for bringing about an awareness of possible lesson plans with technology. Another said modeling technology was "…using the "Smart Cart[vii]," and perhaps some PowerPoint®" (Initial Interview of BB, 9/11/2002). The final participant to be interviewed stated that modeling technology was "…using a variety of strategies to reach a variety of different types of learners" and, "…using technology to show students effective instruction but also so they see, 'OK, here's how [the instructor] used technology for effective instruction'" (Initial Interview of CC, 9/12/2002).

AA was benchmarked at the SoC stage of Consequence for most of the technologies she used. She was not as concerned with how the technology she was currently using affected her but, rather, how it was affecting her students. She wanted to make sure her students were able to use the technology, especially WebCT®, effectively and appropriately. Her LoU was placed at the level of Routine based on her stated technology use. She was using WebCT®, PowerPoint®, and Internet search engines and felt the technology she utilized day to day was operating fairly smoothly. Also manifesting some SoC Personal level behavior, she expressed a desire to improve her technology skills but was reluctant to try things on her own because of perceived protracted time commitments. Learning new things outside of the routine was seen as time consuming and unachievable without personalized help.

BB was at the SoC Informational stage. She knew very little about technology but was very willing to learn. Aspects of the SoC Personal stage manifested themselves as anxiety about the amount of time it would take to learn everything. Since she was using very little technology in her classes, she was classified as being at a LoU level of Orientation; wanting to know more about technology and technology modeling but not quite sure where to begin.

CC was placed at the SoC Management stage because his technology concerns were primarily focused on preparing materials and equipment for class. It always took quite a bit of time for him to get organized to use technology in class and he avoided its use whenever possible unless he had a tech person to help him set things up. Otherwise, he was more at a SoC Informational stage because of his desire to know more about technology and ways he could use technology tools of which he was currently unaware. His LoU was at the Mechanical Use level given that he could perform many technological tasks with the help of detailed printed instructions but had difficulty remembering procedures from one time to the next. He did not have a good understanding of how the technology worked but could follow directions fairly well to make things happen.

The first Team Meeting was held the same day the initial interviews were completed. The three team members were excited to get the study underway and expressed hopes for some good things to happen with their technology growth throughout the semester. During this meeting some ground rules for the study were established. First of all, the study was to be a group effort and the bi-weekly meeting time would be used to "collaborate, commiserate and brainstorm technology modeling ideas to use in the classroom" (Team Mtg. #1, 9/12/2002). I discussed with the team that the premise for the study was to find the best way to deliver technology instruction to them and that they would be helping me in that effort. Time was spent at this first meeting on scheduling for the next seven meetings. The team would meet every other week for one hour until the end of the semester. I asked them to keep reflective journals which were to be reflections of working with me, what types of training they preferred, thoughts of technologies they would like to try, reactions of working with students using technology and general observations about the study.

Brainstorming produced some ideas of what they would like to be able to do in their classrooms with technology. I modeled technology for them by using the rapid fire tool in the software application Inspiration® to keep track of their responses. Their responses started out with ideas of tools they had seen and would like to be able to do including putting video clips, digital pictures, and music into PowerPoint® presentations. One wanted just the "basics" to help her get up to speed with the other two. Some wanted to learn how to use the application Inspiration® which I was modeling. There were also requests to access Channel One®[viii] programming and creating and using distribution lists in e-mail. Ideas to use computer labs for online research components and accessing virtual tours and experiences were discussed. The use of a portable wireless computer lab was suggested as an option as well as access to a scanner to make student work available for preview by classmates on-line. There was mention of trying to use a webcam[ix] to include students at a distance in classes and meetings. The suggestion was then made to use this webcam to view and supervise student teachers via the Internet and to videotape or in some way record sessions so they could be used for teaching methods classes. Voice recognition software[x] was mentioned as a possibility and using a PDA[xi] for assessing students in the field was mentioned as a desirable tool to learn.

Appointments were then set for one-on-one training sessions to be held throughout the coming week. Sessions were scheduled with individuals of the team to train on one or more of their stated desires mentioned above. BB was amazed at the types of technology mentioned in the first meeting of which she had not even been aware. "I felt energized after our first meeting and gained ideas from CC and AA's ideas for technology in their classes" (Reflective Journal of BB, 9/17/02). She wanted to learn how to make a PowerPoint® slide to present for one of her classes and how to use the "Smart Cart" to project her slide presentation and to use the document camera in similar ways as the overhead projector. AA joined BB for her first training session and felt it was a "good refresher" but wanted to learn even more (Reflective Journal of AA, 9/17/02). BB said she "enjoyed the experience" of having her colleague "eavesdrop" in on her training session (Reflective Journal of BB, 9/17/02). I was unsuccessful in setting a training time for CC during this two-week period because of his unsettled schedule at the beginning of the school year. I attempted to make unscheduled visits to show him "one little thing" (Researcher Journal, 9/21/2003) but each time I went by his office he either was on the phone or away.

During each of the subsequent bi-weekly Team Meetings the team members discussed what each of them had been learning and doing with technology and how they were improving. The time was used to learn new activities with familiar software and to find new places to visit on the Internet that would enhance their research components. Almost always time was taken to discuss research on modeling technology and use of technology in teaching. It was interesting and fulfilling to read some of the team members' reflections about some of the things they learned or talked about and how they actually used technology in their classes; "I've used the WebBrain®[xii] stuff that Ron showed us with my classes—so cool!" (Reflective Journal of AA, 9/25/02) and, "This week I learned how to use WebBrain® and Ask Jeeves®[xiii]. I incorporated these two search engines into the research component of my class in Centerville. The students were fascinated by the WebBrain® site and all they could do with it" (Reflective Journal of CC, 10/2/02).

At first, the team member participants were uncomfortable with technology. "I like it and I'm so dumb about it…" (Initial Interview of AA, 9/10/02) was one comment while another quipped, "…for me, [technology is] an add-on and it's not something I've done very much with….It's not at all natural" (Initial Interview of CC, 9/12/02). At our third Team Meeting mention was made that understanding technology was a skill that was "…not one of our intelligences" (Team Meeting #3, 10/8/02). All three team members agreed at a subsequent Team Meetings that there certainly must be another multiple intelligence—technology—as demonstrated by the following conversation:

CC I am almost convinced that there's a 10^{th} intelligence... And it is technology. I mean every computer person I know has this thing where all those buttons that are up there and all that different stuff... They understand there's a logic to a computer and they think like that. And they can work through it, work through it and work through it and they can't possibly have worked through that problem every day for the last year to remember that. It's like another...

AA It is. It is.

CC Don't you think?

BB It's another way of thinking (Team Meeting #7, 12/3/02).

It was also observed that teaching a person how to use technology who didn't have this intelligence was akin to "...speaking louder to a person who speaks a different language" to get them to understand (Team Meeting #7, 12/3/02).

Just because they didn't understand how technology worked didn't mean they wanted to give up on using it altogether. They had no problem not knowing how something worked as long as there was someone around who did, or an instructional sheet that could help them accomplish seldom-performed tasks. [To Ron] "Even though you show me how to do things, you're not gone twenty minutes and I forget how to do it... I would rather just have these "cheat sheets" or whatever. Just these step-by-step here's how you do it and then a phone number to call if it doesn't work. That's all I need" (Team Meeting #3, 10/8/02).

Evolution of the "Cheat Sheet"

It was due to this comment and other similar ones that I began to design and test what they termed "cheat sheets." These instructional sheets were a response to the team members' need for technology instruction and help after I left their offices. The reason for these instructional sheets was summed up by one of the team members in his exit interview.

> "I have no problem not understanding things if I can get access to help. But I know there are going to be some times I'm going to be doing stuff down here at eight o'clock or nine o'clock at night and then I'll get to a certain point and I can't go any

further. And that's the night that I've got to do it. I can't work on it tomorrow night. I can't work on it next week" (Exit Interview of CC, 2/7/2003).

My first attempt at creating these instructional sheets was a handout on marking up a Word® document for grading purposes to supplement WebCT®. I copied information directly from the computer application's Help menu and pasted it into a word processing document. This seven-page instruction sheet was printed out with two pages of instructions per one sheet of paper to save on printing costs. These were handed out at Team Meeting #4 (10/29/2002) and discussed. I went to the office of one of the participants two days later to follow up on the markup process and found out the instructions had been summarily discarded. The participant didn't realize what the handout was for and had thrown it away. These training helps were seen as wordy, unreadable and confusing (Professional Reflective Journal, 10/31/2003). I tried creating tri-fold brochures with screen shots and arrows but was told that "...they [tri-folds] would just get lost on my desk." Two of the participants wanted instructions they could tack on their wall so they "...would not have to take time to look for [the instructions]" (Professional Reflective Journal, 10/31/2002). When comparing types of handouts later, one participant said, "This tends to be what IT people give us [showing instructions printed two pages per sheet] and that, to me, just goes in a file... This one [showing single page, no pictures but numbered steps] to me is so much easier... I like something that I can put on my wall like right there [single sheet with numbered steps]. Short and simple" (Team Meeting #5, 11/12/2003).

The preference, by end of the fifth Team Meeting was a simple, single-page sheet of instructions, numbered with no screen shots or pictures. Taking the one-sheet instructions one step further, I was determined to find out which font and size of font would be most easily-read by the participants, now that it was determined what was preferred by all team members. During our sixth Team Meeting a 'Coke™/Pepsi™ Challenge' was performed in which I had prepared three instruction sheets wherein the content was exactly the same. The only thing different was the font style and size. The first rendition had 14 point Arial font. The second sheet had 12 point Times New Roman font and the third sheet had 10 point Comic Sans font (see Appendix B, Exhibit 7). The vote was unanimous for the original 'Coke™' 14 point Arial font. The font liked the least was the Comic Sans font. "This one

[Comic Sans] is like one of those cheat sheets for dummies with that kind of font. Like those books, you know? … It's like that guy sat back and made fun of us" (Team Meeting #6, 11/9/2002).

Toward the end of the meeting, and almost as an afterthought, I showed the Team Members the flowchart I had initially created for the handout that had been used in the Coke™/Pepsi™ Challenge but thought they would not be interested in it because the instructions were cryptic, had arrows and a screen shot. When he saw the flowchart, CC said, "I'd rather have that. That's easier than [the numbered list in 14 point Arial font]. For me, I see [the numbered list] and I'll just find a different way to do it. [The numbered list] looks like an hour to get a sound byte and I just go… 'I just won't use that in my class.' When I see [the flowchart] I think, 'This is easy.'" BB preferred the numbered list and AA wanted both. She commented, "I would probably use [the numbered list] the first few times and then I'd want to go to [the flowchart] then I could have the quick reminders afterwards." I suggested that I put the numbered list on the front of the sheet and the flowchart on the reverse and BB commented, "That would be best" and AA quipped, "It would be a perfect world" (Team Mtg. #6, 11/9/2002). For examples of the evolution of the 'cheat sheet' see Appendix B.

Evolution of One-on-Two Training

Short, easy training sessions on building e-mail distribution lists and creating folders for file management soon gave way to more involved and intricate training. BB, who had had very little experience with technology prior to coming to the University that fall, took a giant step and learned how to create an Excel®[xiv] spreadsheet grade book and e-mail merge it with Word® to send unique messages to all her students with very little effort. The team members learned how to create and insert sound bytes into PowerPoint slideshows, how to take and manipulate digital pictures, how to design organizational charts in Inspiration®, and how to markup papers on-line using Word® and to send the corrected documents back to students via WebCT®.

Regular training times had to be scheduled because if I tried to just stop by to teach them something I thought they might be interested in, the visit was unexpected, unprepared, and disjointed. All three liked having specific times for me to come to their offices for training. It made it easier for each of them to plan to be in their office and be prepared with questions.

The one-on-two training quickly became a favorite method of personalized training for two of the team members. The first time AA joined BB for a training session, BB simply remarked, "I enjoyed the experience" expressing a tentative attitude toward the concept (Reflective Journal of BB, 9/17/2002). Two months later AA mentioned in her journal that, "BB, Ron and I continued one of our three-way sessions and practice even more with the PowerPoint®. It is so great to be able to bounce ideas off of each of them" (Reflective Journal of AA, 11/7/2002) and, "BB and I do pretty well bouncing things around – we have some of the same interests" (Reflective Journal of AA, 11/14/2002). They found that by "eavesdropping" they were able to pick up on things that they would not have otherwise thought to ask about. BB stated, "What I like [about one-on-two training] is getting more ideas even if at this time with us as busy as we are, I can't implement them right now, they're there. So, I can grab onto them later" (Team Mtg. #6, 11/19/2002). I discovered that the presence of a colleague during training fostered collaboration between the two. They would think of ways to use the technology for projects of which I was unaware. By adding only one more person to the training, three times the communication was created, as demonstrated in Figure 2.1.

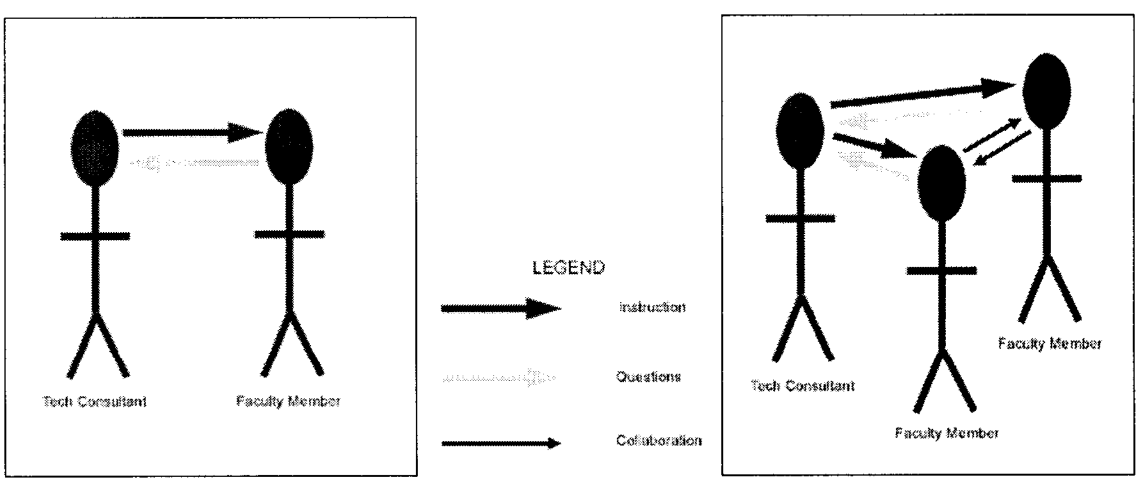

Figure 2.1. One-on-one vs. One-on-two training

Usefulness of Team Meetings

By the end of the study I questioned the usefulness of the bi-weekly team meetings and if they actually served a positive purpose for training. At the beginning of the study our team meetings were scheduled so that they fell on every other week on a Tuesday afternoon to accommodate the schedules of all four of us on the team. This time seemed to work fine until others outside the team imposed their schedules on us. One time the Dean scheduled a meeting that conflicted with our time slot. Doctor's appointments, sick children, a Young Writer's Conference, NCATE reviewers on campus, and plane trip schedules also hampered the timetable. Once there was only one week between meetings and that was after the University had a scheduled Fall semester break causing us to have a three week gap. The final team meeting was to be held sometime during finals week the second week of December but the schedules of the instructors and grading deadlines made that meeting impossible. An early January meeting was planned but one of the team members had to take care of some business at another school out of state and could not meet. As it was, the team met for our eighth and final team meeting late in January without that team member present after all. Schedules had changed enough from one semester to the next that it made it virtually impossible for all of us to get together at one place at the same time.

I made some mention to the group about the usefulness of the team meetings and how I thought they had been designed to develop a sort of camaraderie between team members and that by coming together every other week the team members would be able to share 'war stories' and be able to figure out how to do things better or to say, 'Ah, that sounds neat. I'd like to know how to do that.' I expressed that I didn't know if that really happened.

I suggested that the whole idea of having a cohort group and pulling them together every other week was difficult to do and that the team meetings were not really beneficial (Team Meeting #7, 12/3/2002). After they had had some time to think about what I had said about the uselessness of team meetings, BB commented,

BB I think the idea of meeting together and talking is very helpful because, especially for a novice person like myself, you know, hearing other people's thoughts – people who have used the technology more – it is very helpful."

Later in the meeting the following conversation took place:

RE You mentioned getting together in meetings was helpful.

BB Yeah.

RE How frequently would you see as being most helpful to you? Because we met every other week, basically.

BB For me, I think that's about the right rate because I think if it were less than that I would lose interest. It wouldn't keep me as well.

RE Once a month would be too far apart you mean?

BB I think so. For me it was.

RE Once a week is too much.

BB Yeah, because of the degree of our schedule here, I just think we're too busy to do it more often than that. Every other week was a good pace for me.

AA I'm much the same as BB. I mean, you could almost say "ditto" absolutely in what she said. I found [team meetings] very valuable. I think every other week is perfect timing for me. I think less and then you do lose that strain, so to speak, and more and you get bogged down with it. Time is an issue. I've loved it, though. I mean I've just felt so inspired most of the time and wanting to try more things. Then I get frustrated because it doesn't work or because I don't have the time to try what I want to try. And even like the articles are extremely helpful. It gives me some support for some things that I've been saying about what's been going on in [our local school] right now. But also for taking it out to my classrooms with my students and things. 'This is where you guys are at. You're the ones we're talking about in this article' (Team meeting #8, 1/29/2003).

I discussed the possibility of forming groups of consisting of five or six individuals from different divisions making up cohort research groups that could do many of the things that our little team had done. They agreed that a group size of 5 or 6 was a good size for a group because if one or two couldn't meet because of emergencies or other meetings, they would still have enough to carry on a decent conversation. BB said, "I think probably limit it to that size… I'm somebody that needs to have more interaction and more opportunities to implement and so if you're going to do the meetings coupled with people connecting with each other and implementing, if it gets too big, for me it's not a manageable thing" (Team Meeting #8, 1/29/2003). AA thought I might want to "...level those people out a little bit as far as how technologically apt they were already because I know if I were in a group with somebody that could do things I didn't even understand what they said when they mentioned it, then I would lose interest really quickly" (Team Meeting #8, 1/29/2003). The idea of teams was favored over workshops because with teams, "...there is a sense of commitment when you're part of a group."

Observations on Modeling Technology in the Classroom

A major outcome of our study was the change in perception of how technology could be modeled in the classrooms. At first I thought that I had an understanding of how each faculty member could and would use the technology available in the classrooms but this research proved I was wrong.

In most of the classrooms in which they were teaching, Smart Expression® tables had been installed (see Appendix C). These 2.5' x 5' tables-on-wheels are designed to project an image from a data projector that is buried inside the table reflecting the image onto a hinged mirror aimed at the projection screen located on the wall behind the instructor. Each table has a data projector, document camera, VCR, audio amplifier and cables provided to connect a laptop computer to the projector, sound, and Local Area Network. By attaching the appropriate cables a person can show a PowerPoint® presentation, perform an Internet search, download and use files over the LAN, show a videotape from the VCR or video from the computer, use the document camera to project handwritten notes or text directly from a book or periodical. Adapters are also provided to attach external devices such as small camcorders, portable DVD players, gaming hardware, or digital cameras to project images provided by those peripherals onto the screen. Although designed with wheels, these tables are not moved from the classrooms in which these team members taught. Sixteen Smart Expression® tables were purchased by the University during the summer of 2000 and placed in the larger classrooms around campus. Brief training was held on their operation and the faculty was expected to use them as they taught their classes.

It was my thinking that most instructors could use their laptop computers combined with these Smart Expression® tables to deliver instruction to their students. They could show videos, play sound files from their computers, present lecture notes with PowerPoint®, display handwritten or text using the document camera, and perform Internet searches for and during class discussion.

Four weeks into the study, I learned during one of our bi-weekly team meetings that, according to one of the participants, they couldn't be expected to model technology in the classroom because, "There aren't any classrooms equipped with technology" (Team Meeting #3, 10/8/2002). Even though most classrooms had been heavily equipped with these Smart Expression® tables, the classrooms still did not have any technology in them with which to teach because teaching this way with all this equipment was,

> "... still information coming from a screen or a person at the front of the room while everybody in the room sits and takes notes and watches. It's not interactive. There's nothing grouped. There's nothing constructivist about it. It's still another form of lecture and I think you can model without everything coming from one spot in the room" (Team Meeting #3, 10/8/2002).

While this participant was very pessimistic about the lack of technology available to model in the classrooms, another was very pragmatic.

> "It would be great to have classrooms that are totally equipped, but we don't so we do what we can. Most of our students won't either so maybe the importance in our modeling now becomes how to utilize what you've got when you don't really have what you want" (Reflective Journal of AA, 10/29/2002).

It was suggested that teachable classrooms should have computer access for several groups of students (5-7 groups) and a printer in the room in order to foster research and group collaboration. When assignments are made for research and the students leave the room to find information,

> "...it is not the same as the off-campus scenarios [which has all resources in the room] because I am not there to assist with the search and also because they just go far enough to write the paper. When the research component of a project can take place in a contained environment where I am present, the capacity for learning is much higher. I can offer suggestions and the students can play off of each other to a

much greater extent. The difference is night and day." (Reflective Journal of CC, 10/9/2002).

It was suggested that one way to train teachers how to model technology in the classroom would be to model technology for them with short training sessions. Sessions such as this were generally most successful as meetings over lunchtime where they could bring their lunch to the session. These lunchtime, or brownbag, meetings were suggested as being more useful if they were held in a classroom they normally use for teaching. That way they could witness the technology being used first-hand in the situation in which they are expected to model it (Strudler, McKinney & Jones, 1995). I had used brownbag lunches before as a way to offer awareness activities but had never considered holding them anywhere but in meeting rooms near the food venues. Holding training in actual classroom makes sense from the standpoint of modeling technology for the faculty which they, in turn, can model for their students.

Results of Training Sessions

This study was about developing instructional aids and methods of training designed to help faculty utilize and model technology in their classrooms. It was designed as an action research study to enable the team of researchers to continually cycle back and reassess the progress and outcomes of the research. Some interesting things were discovered about ourselves, as well as our program, during the process.

One tool all three of the participants were using by the end of the study was PowerPoint®. They were using it primarily for short discussion starters in class. One also used it to create handouts for students, "Because I think if you use that every day it gets to be satiation in a behavioral term. You get too much of the same thing. So, I do the handouts for them and then they can take notes…" (Exit Interview of BB, 2/5/2003).

The one participant lacking in basic computer literacy did learn how to create folders and did learn how to use the spreadsheet program. In fact, a comment made by this participant nine weeks into the study was,

"I learned some basic things in Excel®. I'm helping a school do a $3 Million budget right now and so I did the entire thing in Word® with a calculator which was just…I mean, you can't believe the number of hours. And then when [Ron] showed me how to do this in Excel® I wanted to punch him" (Team Meeting #5, 11/12/2002).

Throughout the course of the study, the faculty team members created files and materials for their classes designed to help in the delivery of course material. One of the participants was using Inspiration® more and more to organize thoughts and create mind maps of information for students. The e-mail distribution list was one tool that all three began using to communicate with their students about class housekeeping matters more frequently.

Several challenges were solved just by identifying what the team members wanted to accomplish. For example, BB wanted a way to inform her students of their grades periodically and asked for instructions on how to create a distribution list in her e-mail program. She was going to send a list of all the grades to every student in the class and have them pick their grade out of a list of randomized identifiers. I demonstrated to her how to run an e-mail merge from Microsoft™ Word® using Excel® as her grade book and data source. This gave each student a unique message with only their grade and unique comments about that grade using the "IF" statement within the word processor's mail merge facility. She has used this tool several times and likes the flexibility it gives her to send unique e-mail messages to her students. The process saves her time as well which was very important to her.

I worked at helping these faculty participants become more familiar with the technology they used daily and to be able to troubleshoot simple problems that came up from time to time. I prepared different types of instructional aids for their reference after they had been trained on how to use a tool. These instructional aids, or "cheat sheets," seemed to be most helpful in the training process because not only were the materials available all the time, they were reminders of what they had already experienced.

Conclusions

In this study I looked for tools that would help educate faculty to use technology in the development of a student-centered curriculum. Collaborative one-hour team meetings were found to be helpful in fostering community and developing a deeper understanding of the literature in the field similar to how Davis (1997) used collaborative groups to research and discuss current technology trends in education. The timeframe of holding meetings every other week was seen as optimal. If held more frequently there would not have been enough time to read and think about the literature and, if held less frequently such as once per month or quarter, interest would wane. Nowhere in the literature did I find mention of one-on-two training or mentoring as being effective. Most all of the training mentioned in the literature was either one-on-one or in larger groups as in lunchtime meetings or workshops. This research found one-on-two training to be more useful for the trainees than one-on-one training. It tended to result in more dialogue and generate more creative ideas when the extra individual was involved. Even though the 'eavesdropper' might not be at the same literacy level as the chief trainee, ideas were gathered and awareness was made of certain applications or procedures. The group was small enough that dialogue and questions were easier to evoke from individuals and brainstorming became a mainstay of the conversation. The 'cheat sheet' instructional helps were designed to assist as a memory tool to help with seldom-performed tasks. After being trained in a procedure, the faculty could refer to the step-by-step instructions to help them through the procedure at any hour of the day or night. The inclusion of a bubble flowchart on the reverse of the instructions gave them the option of looking at a simpler version of the instructions and following the diagram. These three tools can be utilized at any college or university where faculty development is offered. They are simple to implement and use, yet have proven to be quite effective.

Barriers that prevent faculty from learning how to utilize technology are time (Goodale et al., 2002), a lack of recognizing relative advantage (Rogers, 1995) and core values (Cuban, 1998). By helping to remove these barriers, technology can be seen as an important tool for the development of quality education. Once an awareness of different technological tools is achieved, some relative advantage to using it can be maintained. By using the newly-found tools at their disposal, preservice educators can use technology to model for their students methods of pedagogically effective uses of technology in the curriculum (Hunter, 2001). Offering special training strategies such as one-on-two instruction, collaborative team meetings, and instructional 'cheat sheets' can be effective in removing barriers that keep faculty from learning how to utilize technology in their classroom curriculum. The faculty participants in this research found the bi-weekly meetings and the instructional sheets to be helpful in removing barriers of time and insecurity with technology. As they move into fresh semesters, they all are using technology in more imaginative ways in their classrooms.

As a follow-up to this research, I am helping to develop university-wide and cross-departmental research communities that spend time together every other week discussing research in the field of technology and modeling. Groups are limited to five or six individuals to keep the groups small enough to foster community but large enough to stay viable in the event that one or two individuals cannot make meetings for extenuating circumstances. Individualized or one-on-two training is generated from these research communities and is available through requests to our Instructional Technology Services department. 'Brownbag' informational lunches will be offered at the different classrooms where the faculty members teach. By doing so, the faculty has opportunity to have technology modeled for them in the very classrooms they use for instruction. McKinney in Strudler et al. (1995) noted the necessity of modeling technology for the faculty in order for them to learn how to model technology themselves.

The findings in this study are important to our university because our university will be able to use the tools and methods found with the School of Education faculty members and transfer them university-wide to the rest of the faculty. Because action research is designed to look deeper into one's own practice I cannot be certain of the transferability of these findings to other colleges and universities. However, the simple tools discovered and developed in this study can be recommended as a good place to start for those looking for ways to improve faculty development.

I would agree with Rogers (1995) that teachers will not use technology if they feel there is no relative advantage in using it. They will not, and did not, learn any technology in which they felt they were wasting their time. If paper and pencil worked just as well for an assignment, they would use that instead of technology. This research also confirmed that different people have different levels of need and comfort in using technology or any innovation. What they termed an additional 'intelligence' related to an early Stage of Concern outlined in Hall & Hord's (2001) Concerns-Based Adoption Model. I am convinced that faculty members' awareness of ways to utilize technology as a classroom tool will develop with time as technology is adopted to serve education.

[i] Word® is a word processing computer program designed by the Microsoft™ Corporation. http://www.microsoft.com/office/word/default.asp
[ii] PowerPoint® is a computer software program developed by the Microsoft™ Corporation designed to build business-style presentations to be projected on a screen. It can also be used as an effective teaching tool with handouts and non-linear presentation options. http://www.microsoft.com/office/powerpoint/default.asp
[iii] Inspiration® is a computer "visual thinking tool" designed to organize thoughts in outlines, flowcharts, and organizational charts. http://www.inspiration.com.
[iv] HyperStudio® is a computer program designed to create hypermedia presentations, mainly used by elementary and middle school students. http://www.rogerwarner.com
[v] WebQuests® are units of study organized by students using the Internet and World Wide Web to organize the materials. http://www.webquest.com
[vi] WebCT® is an Internet Course Management Software system designed to allow students to take part or all of their courses on-line. http://www.webct.com
[vii] The Smart Expression® model 503 Mobile media Cabinet, sometimes referred to as a "Smart Cart," is a portable presentation table designed and built by the SmartTechnologies™ Corporation in which is installed a data projector, DVD/VCR, document camera, amplifier and wireless mouse. They are connected by cable to the Local Area Network and are designed to connect a laptop computer to project through the data projector onto a screen. http://www.smarttech.com/products/expression/exp503/index.asp
[viii] Channel One® provides subscription educational programming via satellite for over 12,000 middle, junior and high schools. http://www.channelone.com/common/about/
[ix] A webcam is a camera connected to a personal computer used to broadcast live motion visual images over the Internet.
[x] Voice recognition software, such as IBM™ ViaVoice® and Dragon Naturally Speaking®, is software designed to convert spoken language into word processing documents.
[xi] PDAs or Personal Data Assistants, are portable handheld computers with touch-screen monitors. They are designed to accommodate literally hundreds of types of programs. Examples of these very small computers can be found on-line at http://www.palm.com or http://www.handspring.com.
[xii] http://www.webbrain.com
[xiii] http://www.aj.com
[xiv] Excel® is a spreadsheet computer program designed by the Microsoft™ Corporation. http://www.microsoft.com/office/excel/default.asp

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An Instructional Technology Director's Changing Views of Faculty Development: Insights from Action Research

A paper to be submitted to Contemporary Issues in Technology and Teacher Education: Technology Section (CITE) http://www.citejournal.org

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Abstract

This article describes a study of the personal practice of an instructional technology services director at a small, Midwestern, liberal-arts university. It provides insight into his evolution in teaching philosophy as he struggled with his concept of technology literacy instruction while searching for better methods of providing faculty development in that area. The cyclical nature of the participatory action research model he utilized assisted him in improving his practice and in developing an effective educational environment for his clients; the faculty. Barriers related to faculty use of technology in the classroom are explored and ways to help overcome these barriers are suggested. Change theory and how people deal with innovations and change is discussed. Action research also helped the author and researcher to notice some of his own biases toward instructional delivery which were originally more teacher-controlled and less student-centered, and helped him evolve in his philosophy of education to become more aware of different ways of modeling technology in the classroom.

Introduction

Education of the 21st Century brings about visions of high technology being used in wonderful and interesting ways to help educate our children in schools around the world. The rate of technology growth is unparalleled in history heretofore and opportunities are unmatched in the abilities people have in using technology easily and effectively to communicate, research and simulate. Even though these possibilities exist, the literature describes a quite different reality.

Reed Hunt, Chairman of the Federal Communications Commission states that, "There are thousands of buildings in this country with millions of people in them who have no telephones, no cable television, and no reasonable prospect of broadband services. They're called schools" (Milken Family Foundation, 2003). While schools have limited access to technology and the outside world, Niki Davis (1997) observes that, "The social context for teachers today, both inside and outside education, is clearly influenced by new technologies." Models of teaching that use technology as a tool in the classroom to help students achieve must be provided to attain this social context (Bitner & Bitner, 2002). There is a need to educate preservice teachers to be capable to teach with the technology of the future, not only with what they find available in classrooms today. Jerry Willis notes that,

> Teacher education programs should not simply prepare students to use the technology currently in schools, they should anticipate future developments and help students cultivate strategies for learning and using new technology as it becomes available (Willis, 2001).

It follows that we should expect teachers to incorporate technology into their teaching. However, according to Zhao & Cziko (2001), three conditions must first be met for faculty to accept and integrate technology into their curriculum: 1. They must believe that technology is more effective than what they are currently using, 2. they must believe that technology will not be disruptive, and 3. they must believe that they have the technical skills and resources to achieve their goals. The first condition could be met through sharing research with the faculty and building an awareness of teaching possibilities using technology. However, many will have to 'see to believe' that technology is more effective in certain situations in order for them to adopt an innovation (Rogers, 1995). The second condition is addressed by helping faculty members learn models of classroom technology integration, management, and troubleshooting to help alleviate disruptions. Finally, the third condition is dealt with by offering technology literacy training for each individual at their Stages of Concern and Levels of Use (Hall & Hord, 2001) to make learning the technology a positive and worthwhile experience.

Research has shown that technology integration modeling is needed but lacking in preservice education classrooms (U.S. Congress Office of Technology Assessment, 1995). Faculty in colleges and universities know how to use technology to prepare for classes but are still uncomfortable using technology for educational purposes (Moursund & Bielefeldt, 1999, p. 28). Technology literacy is not enough. It is also important to teach preservice teachers how to incorporate technology pedagogically into their curriculum (ISTE, 2002). Research also suggests that teachers teach the way they had been taught (Myers, Miels & Ford, 1997) and that teacher educators model this conservative traditional teaching approach to their students who, in turn, model their professors (Groves & Zemel, 2000).

Removing Barriers to Using Technology in the Classroom

Change and innovation are accepted by people in different ways and at different rates depending on individual backgrounds and personalities (Hall & Hord, 2001). Accepting technology as a useful tool in the classroom is no exception. Some barriers, both real and perceived, hinder teachers from reaching their potential in using technology in their curriculum. The majority of teachers fit into a maintenance, or comfort, level with their teaching procedures and pedagogy (Hall & Hord, 2001). When a procedure or model works well it is difficult to abandon when the innovation designed to replace the old way does not seem to offer any relative advantage to make the change (Rogers, 1995).

The most notable barrier preventing higher education faculty from learning to utilize technology is the lack of time (Carney, 1998; Goodale, Carbonaro & Snart, 2002; Stuhlmann & Taylor, 1999). Doing things in new ways takes time before these ways become automatic and comfortable (Hall & Hord, 2001). Development time is needed for preparing coursework in new ways. There also needs to be some perceived relative advantage for faculty to use technology in the classroom before changes can take place (Rogers, 1995). Core values in education are important to parents and teachers and need to be addressed, understood, and dealt with before any real growth in technology use can occur (Cuban, 1998).

Research does show that rewards and incentives help to increase technology use by faculty (Brown, 2000; Jenson, Lewis & Smith, 2002). Also, if the faculty is given ownership of the solutions to how technology will be used in their classrooms, technology growth will occur more rapidly (Drazodowski, Holodick & Scappaticci, 1996; Hunter, 2001; Rice & Miller, 2001).

Colleges and universities are currently employing many different methods to help faculty develop in the area of technology integration. Release time and extra money are helpful to motivate faculty to learn (Sibbett & Stokes, 2003), but other strategies such as modeling (Francis-Pelton, Farragher & Riecken, 2000), mentoring (Chuang, Thompson &

Schmidt, 2002), or workshops (Cavanaugh, 2002) have been shown to be helpful in training teachers effectively. Community building and peer help seem to bring about advanced growth in technology usage when faculty can observe how others are using technology in the classroom (Davis, 1997).

The Search for a Solution

I am employed as the Director of Instructional Technology Services at a small, Midwestern liberal-arts university. My desire was to look at my practice to find effective ways to motivate the faculty to use more technology in their teaching. To show the faculty some relative advantage for using technology, I needed to provide proof of the importance for them to model technology in the classroom for their students. I decided to use action research as a tool to help me understand the faculty's technology training needs and how to offer a more effective training model than what I had been using.

Action research is an excellent way for practitioners to look at their practice to analyze strengths and weaknesses. In fact, action research has been shown to have some very positive long-term effects in regards to educational projects. These long-term effects include a lasting improvement to teaching, a knowledge of how to conduct action research, the ability for teachers to monitor and reflect on their own teaching practices, and better teamwork skills (Kember, 2002). The cyclical nature of action research affords the opportunity to re-visit the problem over and over again. The continuous evaluation and re-statement of the problem helps the practitioner to modify and build on current experiences throughout the duration of the study. In some sense, action research never really ends because each time the problem is re-visited and evaluated the cycle can begin all over again.

This paper tells the story of how I, as the Director of Instructional Technology Services at a small Midwestern university, took the opportunity to look at my practice to determine how to become more effective at helping my clients, the faculty, become more adept at using and modeling technology in their curriculum. It also tells of how I came to understand some of my biases in regard to technology modeling in the classroom. Action research helped me understand how communities of practice were helpful in developing technology awareness and to study other research to determine how other colleges and universities approached their faculty development.

This research also serves as a starting point for me, in my philosophy and assessment, to help enable me to become a better director and one who is more aware of what is happening in the field of education today. I sought better ways to reach the faculty and to understand their teaching needs so they, in turn, could become better modelers of technology in their classrooms. In the process, I came to understand how to approach faculty better and to meet them at their point of understanding and need. Action research enables action as part of the process and encourages the perceived goals to change during the course of the data collection (Wadsworth, 1998). Through the recursive nature of action research, I was able to learn from myself and determine how I think in relationship to training and how to change my own behavior.

Action Research

Action Research (AR) is a group of research methods which allow practitioners to study their own practice and make continual adjustments to said practice. It also allows the subjects to become co-researchers and to make decisions that will help determine their own fate. This type of research is defined as being "democratic, equitable, liberating and life enhancing" (Stringer, 1999). AR was my choice of research method for researching this problem allowing me to be able to be part of the research and attempt to improve my practice in the process. I adopted Stringer's (1999) approach to AR for my own work, so I will describe it briefly before discussing how this developed in my own case.

AR Framework

Ernest Stringer (1999), in his book "Action Research," describes a "Look, Think, Act" approach to researching a stated problem. Even though the "look, think, act" cycle is presented in a linear format, it is to be read as a continually recycling set of activities. The activity of action research is always cyclical and ongoing.

The first stage of Stringer's AR cycle, Look, is designed to bring the stakeholders together in their thinking and deciding what it is that needs fixing. It also is a time to analyze taken-for-granted visions and versions of reality that make up people's day-to-day life-worlds, bringing their unquestioned assumptions, views, and beliefs out in the open and displaying them for inspection.

The second step, Think, is the stage in which researchers explore and analyze what is happening and try to interpret and explain. The task at this point is to interpret and make understandable the data that is collected and to report on what is happening and how it is happening to all people involved in the study.

The third step in this AR cycle is Act. What does one do with this new information? How would the researcher analyze and evaluate this new data? The researcher now asks what it is they should do differently to get better results, so they can eliminate inappropriate ways of working and formulate their professional activities in ways that are more productive and less problematic.

LOOK

I began the study with Stringer's Look stage to determine what, in my practice, was in need of fixing. The problem I struggled with was the challenge I was having in providing quality technology training for faculty designed to train them how to model and use technology in their classrooms. My research team and I agreed that modeling technology for students was one of the best ways to teach students how to use technology for instructional purposes. We also agreed that not everyone was able to understand technology or how to use it as easily as some. A flexible and responsive approach was begun with the three participants; not knowing where the process would lead us. Even though I knew I would be directing a case study of the three participants, individually and as a team, I also realized that the research methodology would emerge from the study as we progressed. I was the team's technology 'expert' that was to help them get through the technology literacy part of the study. The team enlightened me on the best ways for them to learn these skills through some recursive experimenting. I also kept my journals and learned from my own observations about what was and was not working and revised treatment to suit.

To find out why things were not working for me in my department, I felt it was most useful to take a good look at the one thing in my department that I had the most control over; namely myself. To get a good sense of what my philosophy was and why I approached the development training process as I did, I will start with a discussion of my grounding principles.

Educational Background: My background is in education. I received my Bachelor of Arts degree in elementary education in 1976 and taught a few years in upper elementary grades. In 1987, I completed my Master's degree in Instructional Technology with a media management option. This level of education helped me secure a job as an Elementary Library/Media Specialist at a metropolitan school district in the Midwestern United States. After working there for seven years, I began serving as the Director of Instructional Technology Services at a small four-year Midwestern liberal arts college. At the College, my job was to manage the audio-visual services with one part-time employee to assist, and to help the faculty become better users of technology, both personally and in their classrooms.

In my quest for becoming a certified media specialist, my coursework back in the mid-1980s taught me to look at technology training as a procedure comprised of stated objectives, pre-planned activities, and expected outcomes. One of the main texts for my

Table 3.1. Heinick, Molenda and Russell's ASSURE model of instructional delivery

Analyze learner characteristics	Identify your learners to select the "best" medium to meet the objectives.
State objectives	Stated in terms of what the student will be able to do as a result of instruction.
Select, modify, or design materials	Based on the two previous steps, choose from the following: 1. select available materials, 2. modify existing materials, or 3. design new materials.
Utilize materials	Plan how the materials will be used and how much time will be spent using them.
Require learner response	Students must practice what they are expected to learn and should be reinforced for the correct response.
Evaluate	Evaluate the instruction's impact and effectiveness. Did the students meet the objectives?

coursework was Heinick, Molenda and Russell's *Instructional Media and the New Technologies of Instruction* (1982). This media center text outlined the systematic planning for the use of media, including personal computers. The authors used what they termed the 'ASSURE' model which would take trainers through six distinct steps to teach a task: Analyze learner characteristics, State objectives, Select, modify, or design materials, Utilize materials, Require learner response, and Evaluate (see Table 3.1). Each task was objective-based. Also, the Heinick text goes into great detail on the proper way to display multi-media and how to lecture with media. It discusses the proper size, contrast and color of the media used to make it more useful in instruction or, more notably, lecture. Robert Mager, who popularized the use of objectives in programmed instruction, states in his book *Preparing Instructional Objectives*, "If you're not sure where you're going, you're liable to end up someplace else—and not even know it" (Mager, 1975) which sounds vaguely familiar with the AR point of view of creating reality out of action. What Mager was referring to as a negative in approaching programmed instruction, has turned out to be a positive in working with AR. I was trained and familiar with forming formal objectives and expected outcomes and then training instructors how to lecture effectively with media.

My background in change theory has it roots in Ronald Havelock's change agent model of promoting training to faculty. I learned this change theory model in the mid 1980s while I was working on my Master's degree in Instructional Technology. Havelock outlines six steps for getting teachers to change the way they teach and to gain acceptance to a new procedure or innovation. The six steps are:

1. The change agent develops a viable relationship with the client system
2. The change agent diagnoses the problem to be solved
3. The change agent acquires relevant resources to encourage the change
4. The client chooses a possible solution to their problem
5. They move the accepted solution to adoption by the widest possible number in the client system
6. The client is taught how to repeat the procedure to create a sense of stabilization and self-renewal and is provided tools and resources to self-perpetuate the new problem-solving technique (Havelock, 1973).

Formal preparation in Instructional Design was influenced by Jerrold Kemp and his textbook *The Instructional Design Process* (Kemp, 1985). His instructional design model is also behavioristic in nature. It is a systematic, instructional, practical planning method consisting of ten elements as shown in Figure 3.1. The complete instructional design plan is: 1. Assess learning needs, state goals, constraints and priorities, 2. Select topics or job tasks, 3. Examine characteristics of learners, 4. Identify subject content and analyze task components, 5. State learning objectives, 6. Design teaching/learning activities, 7. Select resources, 8. Specify support services, 9. Prepare to evaluate learning, and 10. Pretest learners (Figure 3.1). This instructional design model also puts the instructional designer into

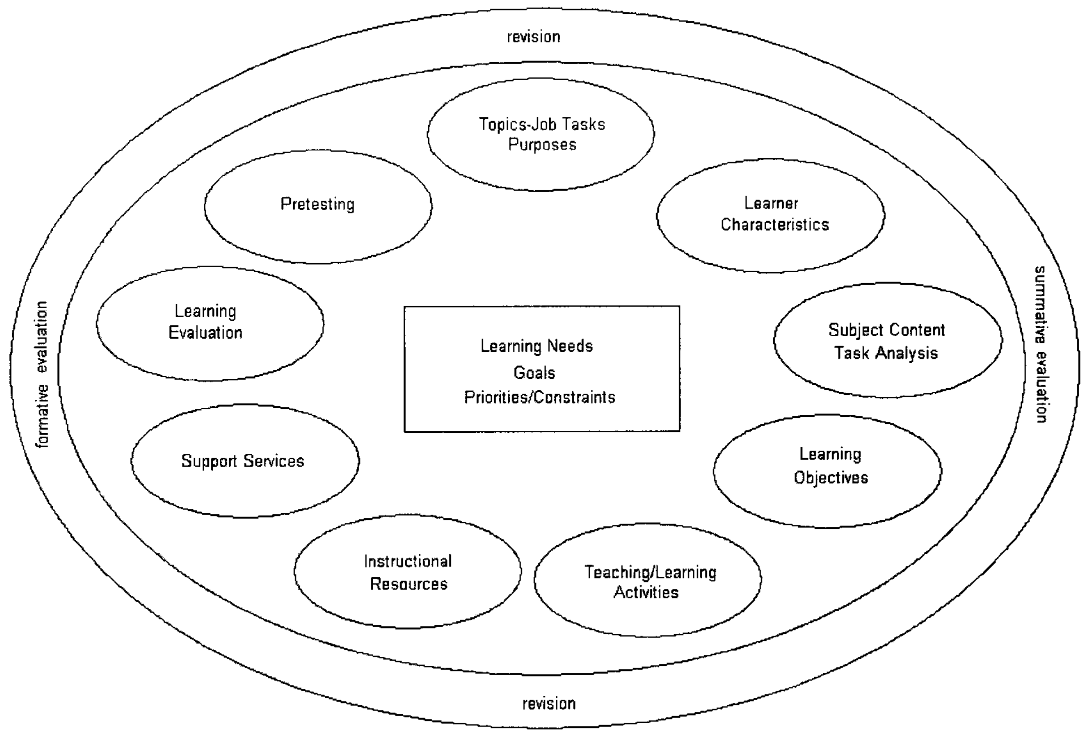

Figure 3.1. Kemp's Instructional Design Model

the position as the expert and the learners as those who follow learning objectives to accomplish a goal.

Work Background: Personal computers had been introduced to the faculty offices at the College only a few years prior to my coming. When I first came to the College in 1994, no faculty members were using computers for any presentation applications or simulations in the classroom but were using them mainly for course preparation, grade books and e-mail. Our College had two twenty-unit computer labs that were used primarily for instruction and paper writing. Internet use was limited and even discouraged if there were students waiting to write papers.

Within my first year of employment with the College, I was appointed to coordinate and manage a five-year U.S. Department of Education Title III grant. This grant was directed at building equity of network services and access for off-campus and distance learning students as well as training faculty and on-campus students to utilize the technology provided through the grant. My focus changed and was no longer only on University-wide technology faculty development but was directed specifically toward grant objectives.

In the ensuing years my part-time help was replaced with student workers to help in the deployment and setup of audio-visual equipment as well as assisting faculty and staff in computer software training and troubleshooting. The coordination of this student program became my priority after the Title III grant was completed. By May of 2002, my student worker staff had been reduced from 120 hours per week to 60 due to budgetary cuts. Consequently, the majority of my time was spent in the management of the delivery and setup of A/V equipment and troubleshooting computer application problems with faculty and staff. My approach to technology training became more reactive than proactive as I tried to keep up with demand.

Nature of Current Practice: The largest part of my job is to train the faculty at the University how to use and model audio-visual and computer technology in their classrooms. The media center in which I operate is more a concept than a place to train faculty. There is no specific media center area available for training. My office is used to demonstrate tools or provide technology consultations with one or two individuals at a time. Workshops with groups larger than one or two are accomplished in shared computer labs – where faculty get priority scheduling with their classes – or classrooms that we can find empty depending on the time of day and week. Fifty-minute brownbag sessions are sometimes held and usually take place at lunchtime in a meeting room near the snack shop in the Student Union or a meeting room in the basement of the food service commons. One-on-one training generally takes place in the faculty members' offices to take advantage of their computer operating system and settings. I work with the faculty on software literacy, simple hardware maintenance and troubleshooting, and Web course management systems.

My job entails more than just instructing the faculty in technology literacy. My job is also educating the faculty on using technology in pedagogically effective ways. A portion of that training task is to encourage School of Education faculty to model technology in their classrooms which will, in turn, demonstrate to preservice teachers how to use technology in their own teaching (Bennett, 2000).

The year the College was transforming into a university, an Academic Information Systems Steering Committee (AISSC) was formed with the directive to "Develop a functionality plan that increases faculty and student use of information technology in support of quality education" (AISSC, 2000). Three of the seven enabling objectives were directed specifically at technology training and support. Objective 2 stated that, "Faculty and student training for all hardware and software products will be provided." Objective 3 stated, "Assistance for faculty in integrating instructional technology will be provided," and objective 7 stated that, "All classrooms will be equipped so that both students and faculty can take full advantage of the information/computer enhancements available outside the classrooms" (AISSC, 2000). Earlier in the process of developing the AISSC plan of implementation, students and faculty were surveyed to ascertain their technology needs and priorities. The second priority for the faculty – which was also the third priority of the students – was to assist faculty to integrate technology into instruction (AISSC, 1999). The document further went on to list the hardware and software products for which faculty and students should receive training. So far, the technology training mentioned was solely for technology literacy and not pedagogy. Goal 3 of the AISSC recommendations outlined ways to assist faculty for integrating instructional technology into their classrooms. The committee recommended the formation of the Collaborations in Technology (CIT) program which was envisioned as a peer-to-peer mentoring program. The document states that,

> The CIT Program will facilitate partnerships between two (or more) [University] faculty, teaming individual faculty with instructional technology expertise with more novice faculty members. The faculty member being assisted would choose a particular course to target and select a knowledgeable collaborator. The faculty mentor will be given a one-course release for the appropriate semester to work as a CIT Team member (AISSC, 1999).

These CIT teams would brainstorm possible applications of educational technology within a course, locate or develop relevant materials and resources, team-teach class sessions that would rely heavily on instructional technology, and develop written descriptions of their collaborations to share with the rest of the campus. Even though the equipment and software recommendations were adopted by the University, the funding for the CIT initiative was not.

The need for more technology training was still apparent. Several training efforts sponsored by my department, Instructional Technology Services, were attempted with limited funds and personnel. Hour-long workshops, lunchtime 'brownbag' sessions, and one-on-one training were the main methods of training delivery. The workshops and brownbag sessions were lightly attended and the one-on-one training was time consuming. Similar to other faculties around the country (Cuban, 2001, chpt. 4), our faculty was using the technology at its disposal for class preparation and personal productivity, but not in the classroom. The technology I witnessed being used in classrooms consisted mainly of PowerPoint® presentations and videotapes.

The campus-wide AISSC 2000 technology initiative at our University placed laptop computers into the possession of every faculty member to use in their course preparation, research, and teaching. One Local Area Network connection drop was installed in every classroom to use with these laptop computers. During the summer of 2000, I had spent a good deal of time putting together seventeen Smart Expression®[i] tables which I truly felt would encourage faculty to model technology in the classroom. I knew that, at the very least, the technology would be more available and the faculty would be able to utilize it in their teaching. Included with each of these tables is a data projector, a document camera, VCR, wireless mouse, connection to the Local Area Network, and an amplifier for audio. Faculty members can connect to the outside world through the Internet and bring up research, show video clips and demonstrate concepts with their computers as well as present their notes with PowerPoint®[ii] or the document camera. To me, it was the perfect tool to use to model technology in the classroom. I would find out during the study that the three faculty participants would challenge my concept of course delivery and modeling technology in the classroom.

Personal Goal for This Research: My personal goal for this research was to find efficient ways to help the faculty with their technology growth. In past semesters, small-group workshops designed to train the faculty in technology use had been poorly attended. It was proving ineffective for me to determine the technology they should be learning. The faculty needed to tell me what tools, times, and methods worked best for them to enable me to become more effective in my training. Frustration had set in because of my inability to determine the best ways to go about this process. I considered using action research as an approach to look at my practice and attempt to find ways to correct the problems I was experiencing. My proposal was to research ways to improve technology training and faculty development through my department. I wanted to deal with the research situation and the people in it as they were, and to make this research project more data-driven. Not only did I want to contribute new knowledge to the field, I wanted to study and improve my own practice. By doing so, my personal and professional development would hopefully grow as a result and the outcomes of the research would ultimately benefit the University as well. My formal education led me to decide what training the participants needed and to determine the proper methods to supply that training. I was not giving the faculty that choice or option to determine those things for themselves. Ultimately, my schooling and background helped me in training the faculty in technology literacy. What I had not learned how to do was to teach them how to use technology in their curriculum pedagogy. I came into the study with preconceived notions of what faculty development was in terms of technology training and felt very strongly in providing the tools for the faculty, then training them how to use them. Subconsciously, I was putting myself into the role of the 'sage on the stage.'

THINK

To begin the THINK stage of the recursive model, I looked to the literature to see what was happening in the field of faculty development and technology training programs. My natural reaction was to use what I had learned when schooling for my Master's degree. I was unconsciously emulating my professors from that program. While studying more recent literature in the field of faculty development in preparation for my research, I was reminded that change theory plays a major role in the acceptance of technology into the mainstream of educational classroom use. Much had changed in the field since my exposure to Havelock in the mid-80s. Research now shows that instead of introducing change to the whole organization at once, individuals have to be ready to accept change for change to happen (Rogers, 1995). Persons in training positions also need to be aware of people's Stages of Concern and Levels of Use toward technology integration before they can even help individuals progress to higher stages or levels (Hall & Hord, 2001).

I chose a research design in which the participants could encounter learning opportunities and meet as a group without putting too much strain on their already tight schedules. We met as a group one hour every other week to evaluate and train and get ready for the next two-week cycle. I transcribed the interviews and team meetings and used these documents, as well as the reflective journals of the team, to add to the data set I was to

Table 3.2. Matrix of Proposed Data Collection Timeline

<table>
<tr><td rowspan="5">Documents from Academic Information Services Steering Comm.</td><td colspan="10">Fall Semester 2002 – 16 Weeks</td></tr>
<tr><td rowspan="4">Initial Interviews of AA, BB, and CC each one hour in length - transcribed</td><td>Team Meeting #1 - Week 1 one hour – transcribed</td><td>Team Meeting #2 - Week 3 one hour - transcribed</td><td>Team Meeting #3 - Week 5 one hour - transcribed</td><td>Team Meeting #4 - Week 7 one hour - transcribed</td><td>Team Meeting #5 - Week 9 one hour - transcribed</td><td>Team Meeting #6 - Week 11 one hour - transcribed</td><td>Team Meeting #7 - Week 13 one hour - transcribed</td><td>Team Meeting #8 - Week 15 one hour - transcribed</td><td rowspan="4">Exit Interviews of AA, BB, and CC each one hour in length - transcribed</td></tr>
<tr><td colspan="8">Individual and one-on-two training - 42 sessions</td></tr>
<tr><td colspan="8">Reflective Journals from AA, BB, CC, and RE - 107 total entries</td></tr>
<tr><td colspan="8">Collection of artifacts from AA, BB, CC, and RE - 47 artifacts collected</td></tr>
</table>

analyze. Each team member met with me, individually, for technology training each week for the duration of the study and supplied me with artifacts of projects they were working on in their quest for technology development. At the end of the study, I again interviewed each participant and transcribed the sessions for use in comparing and contrasting the information they gave me from the beginning of the study and analyzed it accordingly (see Table 3.2).

There were several modifications suggested by team members for the delivery of technology instruction to help them model technology in the classroom. Our small group used Stringer's Look, Think, Act cycle in our quest to find those better tools and methods. We would Look, or define our problem, Think about what we needed to change or modify, then Act on our theories by implementing a new method or skill. We would then evaluate the whole process by Looking at the results and assessing whether we needed to begin the cycle all over again. In this way we were able to perform several iterations of training materials and methods to see what worked for our small group. My data for the Instructional Technology Services Department and training outcomes came from my professional and personal journals which I kept during the length of the study, statistics from workshops and brownbag sessions held in past semesters, and the minutes from our Academic Information Services Steering Committee (AISSC) in which the University was given recommendations for equipment expenditures based on classroom technology needs and forecasted use over a five-year period.

Technology Unavailable: I thought the study was going well and the training of the three team members to be acceptable based on their comfort level with technology. Four weeks into the study, at our third team meeting, we had a lengthy discussion about modeling technology in the classroom. One of the team members took exception to a statement from a Milken Family Foundation study quoted by me that "Many teacher education faculty lack the knowledge and skill to incorporate technology into their own teaching" (Moursund & Bielefeldt, 1999). He said he didn't agree with that assessment and stated that "[Technology] hasn't been thrust into our lap and placed in our classrooms and we're choosing not to use it. It is not accessible…there is no accessibility to integrate technology into our curriculum" (Team Meeting #3, 10/8/2002). The thinking of this team member was that the only way teachers could model technology in a classroom was to fill it full of computers, or at least have one computer for every three people, and a shared printer. This teacher wanted to have collaboration stations, presentation stations, and discussion areas all around the classroom and a connection to the Internet for each of the computers in the classroom. For the full account of this discussion and an example of a Team Meeting transcript, see Appendix C.

What I was originally offended by, then had time to reflect on and reconsider, was the fact that the way he wanted to teach and the way that I was convinced that he should teach were two completely different things. Even though there was technology available for them with the Smart Expression® tables and laptop computers, it was seen by him to be there for lecture only. All the information was coming from one place in the room and one person controlled the conversation. Without realizing what I was doing, I was encouraging them to use the technology to lecture but I did not realize it at the time. I was most comfortable with this model of teaching and was ignoring other models altogether and did not even recognize my own bias. The classrooms were not set up to handle collaborative research, discussion, or discovery.

The Behaviorist Trap: In an attempt to try something more constructivist, I helped one of the team members set up a computer network hub to be used in a 'regular' classroom. Per the AISSC 2000 initiative, only one network drop was in the classroom. Five students out of twenty-nine brought their privately-owned laptop computers to class so they could form small groups to search the Internet for information on the brain. I felt the hub configuration was working well until one student asked me, "Where can I print this information out?" It was then I realized that all the equipment in the room was still not enough and not complete in fostering a creative, collaborative experience (Researcher Reflective Journal, 10/16/2002).

The information on shared learning and constructivism presented to me was unfamiliar but not new to me. I had been in discussions and workshops before where constructivism and constructivist thinking had been the subject and I had been excited about the possibilities. I thought creating meaning out of context was an excellent model to use instead of following pre-planned objectives and programmed instruction. Even though I agreed with the new way of doing things, I still found my own practice falling back to more familiar territory of lecture and discussion. I noticed comments throughout my reflective journal that were very contradictory to the way I wanted to project myself to others as a professional. Comments like,

> I tried to use WebCT as the common medium to use for communication for the team but it looks like they don't really want to use it...I may mandate that they use it so we can take care of business in a timely manner (Reflective Journal 9/30/2002)

and, "I want to show him how to build a spreadsheet and to do calculations but he is not ready...Perhaps later on" (Researcher Reflective Journal 10/31/2002) only verified that I was seeing the faculty members as my audience or clients. I was making the determination of what it was they were to learn or even if they were ready to learn a task. I was not taking into consideration their Stages of Concern or their Levels of Use toward using technology. Another comment was, "I promised him I would look into [putting video clips into PowerPoint®] and try to find a workable solution for video capture" (Researcher Reflective Journal, 11/13/2002) knowing full well that I had no intention of showing him how to do the task because I thought it to be too difficult for him. The comment, "We got distracted" (Researcher Reflective Journal, 11/21/2002) came from a training session in which we began learning about one thing and ended up in a completely different area. I was feeling discouraged that we did not accomplish what it was we had set out to do when, in reality, we ended up talking about and learning what it was the team member really wanted to learn.

Technology Becoming Disruptive in the Classroom: During the course of the study, the team members told of some ways in which technology could become disruptive in the classroom. The most frequent type of comment made was that time was wasted when technology didn't work correctly. One such comment from CC was,

> I've started three classes in the last two weeks where I walk in, I have their attention and I try to play a video or I get there ten minutes early and I can't get it to work so the first five minutes of class I'm trying to get the video to work… When equipment doesn't work, that's the most frustrating (Initial Interview of CC, 9/12/2002).

An additional comment from the same team member was,

> …but when it is time to present, [students] can't get their disk to come up on my computer and/or their computer does not interface with the school presentation cart, and, the next thing you know, 25 minutes have gone by and everybody has been sitting around and are now restless…so I can see why professors and students alike would say, forget it. (Reflective Journal of CC, 10/13/2002).

Another disruption problem noted is the problem of students using the technology for things other than class work and being off-task. Time is lost due to having to explain concepts several times or students missing important information altogether.

> You know, I've tried taking my classes to the lab and I thought I'd just take them all over there where they would all be on the computer but then that adds a whole other set of problems. Now they're all on a computer and half of them go straight to their e-mail or straight to this and you have to just really be on them…It's almost better to stay over here. And they all come straggling in at different times. (CC in Team Meeting #4, 10/29/2002).

BB put the time factor into a mathematical formula as to how much time was actually lost when things don't go right.

> The only thing that I don't like doing is getting up in front of a class and wasting a classes' time because if you waste ten minutes and you have ten people in your class

> you've wasted a hundred minutes that could have been better used. So, that's the part that I really don't like about technology. (Exit Interview of BB, 2/5/2003).

Credibility is another disruptive factor of technology in the classroom. CC stated, "You can only walk in in front of your students so many times and look like you don't know what you're doing before you start to lose some credibility" (CC in Team Meeting #4, 10/29/2002) and, "I refuse to give in, but it is a bit frustrating and I can look like an idiot when I cannot get stuff to work" (Reflective Journal of CC, 10/21/2002). CC goes on to elaborate about lack of troubleshooting skills and why, in his opinion, educators tend not to use technology in the classroom.

> I think this is why school teachers just don't use it at all, because something COULD go wrong and they would be at the mercy of the tech staff who, by sheer geography, are no less than 5 or 10 minutes away....and by then you have lost the kids. (Reflective Journal of CC, 11/21/2002).

Natural Aptitude: Even though we were making some good headway with technology literacy and use, the idea was expressed that there might be an additional intelligence, that being computers or technology. Talking about this further it came out that, for some people, using computers is very easy and natural while, for others, it is not as easy to conquer or learn. They said it was not one of their 'intelligences' referring to Dr. Howard Gardner's theory of multiple intelligences (Team Meeting #3, 10/8/2002). The theory of multiple intelligences was developed in 1983 by Dr. Howard Gardner, professor of education at Harvard University. It suggests that the traditional notion of intelligence, based on I.Q. testing, is far too limited. Instead, Dr. Gardner proposes eight different intelligences to account for a broader range of human potential in children and adults. These intelligences are: Linguistic intelligence ("word smart"); Logical-mathematical intelligence ("number/reasoning smart"); Spatial intelligence ("picture smart"); Bodily-Kinesthetic intelligence ("body smart"); Musical intelligence ("music smart"); Interpersonal intelligence ("people smart"); Intrapersonal intelligence ("self smart"); Naturalist intelligence ("nature smart").

I tried to search my own field of reference for a technology experience that should be easy, or looked easy, but was very frustrating for me. The closest thing I could think of was video games. I have witnessed my son and his friends play video games with the little controllers and have marveled at their dexterity and speed with which they could maneuver through the games they played. Whenever I would try to play some of the games, I would get to a point where the controller would not do what I thought it should or I would miss some of the rules or conditions of the game. Consequently, I would ultimately give up and walk away from the situation vowing never to try again. It was not that I could not learn how to play the games, given time and patience. It was more of a sense of thinking this to be an activity with no relative advantage and my desire to learn was very low. I did not persevere because it became very frustrating for me.

On a similar note, one team member stated, "I have no desire to be a computer technician...I have the drive... I want to be 'this.' And to do 'this' well takes like 98% of my time. Now, the other stuff... I'd LIKE to do it but I've GOT to do 'this'" (Team Meeting #7, 12/3/2002). Unless technology becomes a tool that, to this person, has the capacity to improve his content area, or his 'this,' then there is no time to bother with learning it.

Constructivist Classrooms: One of the themes that came out in our discussions was the need for more constructivist style classrooms in which to model technology. One of the team suggested having "eight modular classrooms right next to the library" in order to have access to the technical support, especially in the evenings. These classrooms would have "computers and technology and open areas to discuss and present and access to the library" (Team Meeting #3, 10/8/2002). At another Team Meeting, one member of the group stated that they had visited with the Dean and said,

> "You know what we need in the Education Department? We need classrooms. We need like here's a model of an elementary classroom and here's a model of a secondary classroom that we can walk groups into and do simulations, have them actually put together centers where we can do all those" (Team Meeting #7, 12/3/2002).

I know from our conversations about the Smart Expression® tables that they wanted to have more technology available with which to teach. I had spent a great deal of time outfitting these multimedia tables thinking they would be very useful in modeling technology in the college classroom. What I found out was they thought of them as basically a tool with which to lecture and that model of instruction delivery didn't fit in their style of teaching. There needed to be a way to fabricate the type of classrooms they wanted to use.

Cheat Sheets: Through the recursive nature of AR, the team was able to help me determine the best type of printed instructions to help them remember what they learned through one-on-one training. After many iterations of what they termed the 'cheat sheet' we came up with an acceptable model. The instructions for a task had to be complete on one side of an 8.5" x 11" piece of paper. All steps to the task were numbered and outlined in a 12-14 point Arial font. The path of the steps taken were abbreviated (e.g., [Insert/Picture/From File...]) and provided the information needed to accomplish the task. On the reverse of the sheet was printed a bubble flowchart with the same information as the front but abbreviated. Most of the time they could look at the flowchart and follow the steps to perform the task. If they became confused they could look to the printed instructions and follow them step-by-step. For examples of the 'cheat sheet' evolution, see Appendix B.

Brownbags: I had held brownbag lunchtime training sessions before and had even initiated a program called 'Wednesday Wowsers' in which I or one of my student workers would demonstrate tips and tricks with the Microsoft™ Office® software products during the lunch hour in a gathering room in the lower level of the Commons. Faculty and staff were invited each Wednesday at noon to participate in the hour-long demonstration and encouraged to bring questions and ideas for future 'Wowser' meetings. We would provide a demonstration only and encourage any who wanted to know more to contact our office to set up an appointment for training. The meetings were fairly well attended by the staff of different departments on campus, however, in three semesters of offering this service, only three faculty ever came. I asked the team what it would take to get them and some of their colleagues to participate in such lunches. There were always several faculty members upstairs eating lunch during the scheduled time.

The one big deviation from normal brownbags that I had held in the past was the suggestion that I hold these new brownbags in the classrooms in which they regularly teach. These classrooms are closer to their offices and are the actual rooms they are being asked to model technology in. This was a very popular suggestion among the team members (Team Meeting #7, 12/3/2002). Always before I had held brownbags either at the commons in a meeting room or in a meeting room near the snack shop in the student union. I was trying to be considerate for those who wanted to purchase their meal and come to the meetings. What they wanted was to have meetings in familiar surroundings.

One-on-Two Training: One-on-one training was the method chosen by me to train the individuals of the group. This was chosen because of their differing schedules and different levels of technology proficiency. At our first Team Meeting I was asked if I would "…let the rest of us know what it is you are doing with CC at a certain time so if we want that same thing we can sit in on the session?" This team member went on to say, "If I knew you were going to do that with CC and it was something I wanted to learn, I could just come over to CC's office." Her reasoning at the time was that, "It might save you doing something three times" (Team Meeting #1, 9/12/2002). We tried the invited training scenario and found the one-on-two training worked better for the people involved than one-on-one training. Later on, BB commented that, "What I like [about one-on-two training] is getting more ideas even if at this time with us as busy as we are, I can't implement them right now, they're there. So, I can grab onto them later" (Team Mtg. #6, 11/19/2002).

Learning Communities: The collaborative group, or learning community that we called our Team Meeting was held for one hour every other week. Because of scheduling conflicts and other priorities it was sometimes difficult to make sure all four of us were able to be in attendance. I had made the comment in our seventh Team Meeting that "The whole idea of having a cohort group and pulling us together—it's almost like it's work" and that it almost was not worth the time to get people together on a regular basis (Team Meeting #7, 12/3/2002). My feelings reflected in my journaling were that the Team Meetings had not been effective and should be abandoned. After the team members had had some time to think about that statement they had comments about what the bi-weekly team meetings meant to them.

> The thing that I found, because coming to [the University] there didn't seem to be any interaction among the faculty across campus or in the School of Education for me to really get to know anybody. And so this is my first semester here so I felt like I got a better sense of who AA was and who CC was and I felt more of a link or a commonality with them and if I DID have a problem—and a couple of times I had a

> question—I felt comfortable in asking either one of them. To me that was a helpful relationship (Team Meeting #8, 1/29/2003).

During AA's final interview I had made some comment about the Team Meetings becoming more of a community-building exercise. She agreed with the comment.

> That's right, because CC and I had never exchanged more than twenty words before but now we feel more comfortable with everything. In fact, he sends me all these nasty [Kansas City] Chiefs jokes [laughter]. Another use of technology. It's a harassment issue, I think. (Exit Interview of AA, 2/11/2003).

My assessment of the usefulness of the Team Meetings had come about full-circle. Initially, I had thought they would be an excellent way to foster community and building relationships within the group. Frustrations came when outside forces controlled our ability to meet on a regular basis causing me to think the meetings were not worth the hassle of scheduling. I was proven wrong by the comments the team members made in their view of the worthwhile function of these bi-weekly meetings.

ACT

What was I to do with this new information? It was time for me to ACT and become aware of what it is I should be doing differently to make a positive change in the way I approached my job. It was time to re-think my whole media center in regards to my approach to training and faculty development.

My plan is to promote a collaborative teaching model in which small groups of faculty form technology projects based on the group's shared common vision for how to improve learning and teaching of their students. A focus on pedagogy and not on the technology skills will be of highest importance. These groups will be formed by promoting community-building within the group and building the teachers' vision of what students might be able to do and learn under new conditions of learning and teaching. Team meetings will be held once every other week during each semester with membership in each group changing every semester based on work load and class schedules. They will discuss research in the field of technology integration, brainstorm ideas while planning to approach new ways of teaching and learning, train on technology literacy, and develop community.

We will also hold brownbag lunches every few weeks as awareness-building activities. These times will be used for the faculty to demonstrate new ways of using the technology they currently have or to make them aware of some new technology that has been purchased and is available. These are also seen as times to have faculty members share how they are using technology in their classrooms and to offer assistance to help others do the same. I will also attempt to hold these brownbag lunches in familiar classroom surroundings to take advantage of the technology available to the faculty and to model its use for them.

For the future, it was suggested that college classrooms be designed in such a way to offer cluster and collaborative learning and to provide technology that the students have ready access to. Because of budgetary constraints and lack of funds we cannot build or fully equip classrooms at this time. In the meantime, it was suggested we make do with what we have.

> It would be great to have classrooms that are totally equipped, but we don't so we do what we can. Most of our students won't either so maybe the importance in our modeling now becomes how to utilize what you've got when you don't really have what you want!!???" (Reflective Journal of AA, 10/29/2002).

What I can do immediately to help faculty with setup and troubleshooting difficulties is to assign extended hours to my student workers to offer assistance on those evenings that classes are held after 5:00 p.m. Every Monday, Tuesday and Thursday evenings a student worker will be made available until 7:00 p.m. In this way, teachers who have classes that begin at 6:00 p.m. or 6:30 p.m. can call for assistance at the beginning of their class and request help if they experience difficulties.

The learning community that we fostered through our bi-weekly Team Meetings could have easily turned into a form of reciprocal mentoring. As mentioned earlier, BB felt comfortable asking her colleagues for help because she felt she knew them and knew their strengths. CC apparently felt comfortable enough with his colleague to poke fun at her favorite football team. Although a formal reciprocal mentoring situation between faculty members was not set in place, the team members were willing to help where they could and mutual benefit was possible. The faculty might not be willing to take the time to teach others how to use technology if they think of it an extra prep but they may be willing if they think of it as sharing and community building. Further research will need to be done to determine if reciprocal mentoring would be an accepted and viable method of colleague interaction and community building.

Conclusions

The research findings that comment on teachers teaching as they were taught (Myers, Miels & Ford, 1997) and students modeling their professors (Groves & Zemel, 2000) provided a strong guide for me as I evolved through this study. My inclination toward lecture and teacher-centered learning were so ingrained that when I was encouraging the team members to model technology in the classroom, I was asking them to teach in the usual, teacher-controlled way but with newer technology. I hadn't considered that these new technology tools might be more useful if used in newer, different, and more creative student ways. It was through the recursive process of action research that I was able to realize these biases and receive feedback on how I was approaching my teaching.

Many other small, rural colleges and universities may have the same types of training challenges we have at our University. Lack of time is a well recognized constraint that makes it difficult to get faculty members to attend training or to try new things and learn new ways of doing things (Carney, 1998; Goodale et al., 2002; Sthulman & Taylor, 1999). Because of our school size and remote, rural location, we don't have the luxury of incentives such as extra money or release time that larger or more metropolitan institutions might be able to provide their faculties as Sibbett and Stokes (2003) have suggested.

A positive for us, as a small, rural institution, is the fact that most faculty members are close in their friendships and community and are willing to share what technological knowledge and expertise they may have with their colleagues. Davis (1997) suggests that when faculty can observe how others use technology in the classroom, community is achieved and greater learning occurs. I found this to be true in our situation.

The research participants agreed that not all faculty members are at the same Stages of Concern or Levels of Use as suggested by Hall and Hord (2001) but found that to be a good thing when it came to our unique brand of one-on-two training. With a second faculty member present and observing during technology literacy training sessions, awareness of new ways of using technology was promoted and collaborative brainstorming and discussion occurred.

Also, our unique method of creating short, instructional 'cheat sheets' was a tool that was discovered and created through the recursive nature of AR. Several different prototypes of instructional sheets were put to the test. One type of "cheat sheet" was preferred by all members of the team; the short, numbered list in Arial 12 point font on the front with the same, albeit abbreviated, information in bubble flowchart form on the reverse (see Appendix B, Exhibit 7). In this way the trained skills could be recalled simply by looking at the flowchart for sequential steps. If the abbreviations were too cryptic, then the front could be consulted for more detailed instructions.

The findings of this research are not widely generalizable to other colleges and universities because of the methods and style of this case study. However, other schools may recognize similar concerns and challenges that we encountered and may find some useful information to promote better faculty development at their institutions. What is generalizable is the fact that AR did indeed work and long-term outcomes of educational action research projects are being realized (Kember, 2002). What works for us at our small liberal-arts university may be a starting point for others to explore through AR. This author looks forward to using this information that has been gathered to build a stronger faculty development program and to continue the approach of AR less formally.

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[i] The Smart Expression® model 503 Mobile Media Cabinet, sometimes referred to as a "Smart Cart," is a portable presentation table designed and built by the SmartTechnologies™ Corporation in which is installed a data projector, DVD/VCR, document camera, amplifier and wireless mouse. They are connected by cable to the Local Area Network and are designed to connect a laptop computer to project through the data projector onto a screen. http://www.smarttech.com/products/expression/exp503/index.asp

[ii] PowerPoint® is a computer software program developed by the Microsoft™ Corporation designed to build business-style presentations to be projected on a screen. It can also be used as an effective teaching tool with handouts and non-linear presentation options. http://www.microsoft.com/office/powerpoint/default.asp

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Appendix A

Semi-Structured Interview Questions

The following questions were delivered as a semi-structured interview. All three participants were asked each of these questions during the pre- and post-study interviews with several probing follow-up questions. The nature of these probing questions depended on the direction each participant took the discussion.

I will be asking some questions pertaining to modeling technology in the classroom and would ask you to respond as completely as possible to each question. We will be delving deeper into each area as the interview progresses in order for me to get a good idea of your comfort level with technology and how you see yourself modeling technology in the classroom to pre-service teachers. I will offer time at the end for you to ask questions of me about the study and the direction we may want to go with it. Do you understand that I will be audio tape recording this interview and that I will be transcribing it for future study?

General information

1. How long have you been in education, either as a teacher or as an administrator?
2. How long have you been teaching in a higher education capacity?
3. What types of courses do you teach for the university?

Technology experience

1. Describe to me your past experience using technology in teaching.
2. Tell me some of the good experiences you have had with technology.
3. Tell me some of the frustrating experiences you have had with technology.

Attitudes toward technology

1. Describe to me your feelings toward technology right now.
2. When I use the phrase "modeling technology in the classroom" what images come to mind?
3. Talk to me about how your students view technology. What have been some of their comments, response to assignments, or attitudes in general?

Current use of technology in the classroom

1. How do you currently use technology in your classrooms?
2. Describe to me a recent project or class in which you used technology.
3. When preparing for and maintaining a course, what kinds of tools do you use? These may or may not be high technology.

Future use of technology in the classroom

1. Describe for me what you would like to be able to do in your classroom with technology but have been reluctant to.
2. What obstacles do you see in preparing to use technology as a tool in the classroom?
3. What excites you about using technology in the classroom? What scares you?

Can you think of anything we may have left out that you want me to know about? What questions do you have for me about this study?

Exhibit 1. Questions used in semi-structured interview at the beginning and end of the study

Appendix B

Examples of 'Cheat Sheet' Evolution

Adding Hyperlinks to Microsoft® Office™ products

To create more customized hyperlinks, do one of the following, depending on what you want to link to. Note: When the instructions say to **Insert Hyperlink** you can either look for the icon on the Standard toolbar that looks like a globe with a chain link below it, select the **Insert** menu and click on **Hyperlink...** or use the keyboard shortcut **Ctrl-K**.

A. Link to an existing or new document, file, or Web page

1. Select (highlight) the text or picture you want to display as the hyperlink, and then click **Insert Hyperlink** on the **Standard** toolbar.
2. Do one of the following:
    a. Link to an existing file or Web page.
        i. Under **Link to**, click **Existing File or Web Page.**
        ii. Do one of the following:
            1. If you know the address you want to link to, type it into the **Address** box.
            2. Click one of the locations under **Look in**, and then locate and select the link you want.
            3. If you don't know the address of a Web page, click **Browse the Web** icon (looks like a globe with a magnifying glass on it) to switch to your Web browser, open the Web page you want, and then switch back to Word.
    b. Link to a file you haven't created yet.
        i. Under **Link to**, click **Create New Document.**
        ii. Type a name for the new file. You can also specify the path to the new file and then choose whether you want to open the new file for editing now or later.
        iii. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want. Word uses the path or address of the file as the tip if you do not specify one.

B. Link to an e-mail address

1. Select the text or picture you want to display as the hyperlink, and then click **Insert Hyperlink** on the **Standard** toolbar.
2. Under **Link to**, click **E-mail Address.**
3. Either type the e-mail address you want in the **E-mail address** box, or select an e-mail address in the **Recently used e-mail addresses** box.
4. In the **Subject** box, type the subject of the e-mail message.
5. ***Note:*** *Some Web browsers and e-mail programs might not recognize the subject line.*
6. To assign a ScreenTip to display when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

    Word uses "mailto" followed by the e-mail address and the subject line as the tip if you do not specify one.

Tip: You can also create a hyperlink to an e-mail address by typing the address in the document. For example, type **someone@graceland.edu**, and Word create the hyperlink for you.

Exhibit 1. 3-page example of first type of instructional sheet taken directly from application Help menu. Page 1 of 3.

C. **Link to a specific location in another document or Web page**

1. Open the file you want to go to and insert a bookmark at the blinking cursor [Insert/Bookmark…].
2. Open the file you want to link from, and select the text or object you want to make a hyperlink.
3. On the **Standard** toolbar, click **Insert Hyperlink.**
4. Under **Link to, click Existing File or Web Page.**
5. Locate and select the document that you want to link to.
6. Click **Bookmark,** and then select the bookmark you want.
7. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

   Word uses the path to the file including the bookmark name as the tip if you do not specify one.

Tip: From Word documents, you can create links to specific locations in files that are saved in Microsoft Excel (.xls) or PowerPoint (.ppt) format. To link to a specific location in an Excel workbook, create a defined name in the workbook, and then at the end of the file name in the hyperlink, type # (number sign) followed by the defined name. To link to a specific slide in a PowerPoint presentation, type # followed by the slide number after the file name.

D. **Link to a location in the current document or Web page**

1. To link to a place in the current document, you can use either heading styles or bookmarks in Word.
2. In the current document, do one of the following:
   a. Insert a bookmark at the location to which you want to go.
   b. Apply one of Word's built-in heading styles to the text at the location to which you want to go.
3. Select the text or object you want to represent the hyperlink.
4. On the **Standard** toolbar, click **Insert Hyperlink.**
5. Under **Link to, click Place in This Document.**
6. In the list, select the heading or bookmark you want to link to.
7. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip**, and then type the text you want.

   For links to headings, Word uses "Current document" as the tip if you do not specify one; for links to bookmarks, Word uses the bookmark name.

Exhibit 1. 3-page example of first type of instructional sheet taken directly from application Help menu. Page 2 of 3.

E. Link to another file or program that you drag from

You can create a hyperlink quickly by dragging selected text or pictures from a Word document or Microsoft PowerPoint slide, a selected range in Microsoft Excel, a selected database object in Microsoft Access, or a Web address or hyperlink from some Web browsers.

The text you copy must come from a file that has already been saved.

1. Display both files on the screen.
   If you are dragging text between two Word files, open both files, and then click **Arrange All** on the **Window** menu. If you are dragging text between two programs, resize the windows of both programs so you can see them at the same time.
2. In the destination document or worksheet, select the text, graphic, or other item to which you want to jump.
3. Use the right mouse button to drag the selection to your publication.
4. Click **Create Hyperlink Here.**

Notes:

- You can also copy and paste text as a hyperlink to achieve the same effect. Copy the text you want to the **Clipboard**, click where you want to insert the text, and then click **Paste as Hyperlink** on the **Edit** menu.
- You cannot drag and drop drawing objects, such as AutoShapes, to create hyperlinks. Use the standard hyperlink procedure to create hyperlinks for drawing objects.

F. Link between frames

1. Select the text or picture you want to display as the hyperlink.
2. On the **Standard** toolbar, click **Insert Hyperlink**.
3. Do one of the following:
   a. Link to an existing file or Web page (see step A2a above)
      1. Under **Link to**, click **Existing File or Web Page**.
      2. Locate and select the file you want to link to.
   b. Link to a file you haven't created yet (see step A2b above)
      3. Under **Link to**, click **Create New Document**.
      4. Type a name for the new file. You can also specify the path to the new file and then choose whether you want to open the new file for editing now or later.
4. Click **Target Frame**. In the **Select the frame where you want the document to appear** list, click the name of the frame that you want the document to appear in, or click the frame you want in the diagram.
5. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

Note: In addition to specifying a frame that you have named, you can also specify that a hyperlink will open a page in the same frame, in the "parent" frames page, or in a new window.

Exhibit 1. 3-page example of first type of instructional sheet taken directly from application Help menu. Page 3 of 3.

Adding Hyperlinks to Microsoft® Office™ products

To create more customized hyperlinks, do one of the following, depending on what you want to link to. *Note: When the instructions say to* **Insert Hyperlink** you can either look for the icon on the Standard toolbar that looks like a globe with a chain link below it, select the **Insert** menu and click on **Hyperlink…** or use the keyboard shortcut **Ctrl-K**.

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2. Do one of the following:
   a. Link to an existing file or Web page.
      i. Under **Link to**, click **Existing File or Web Page**.
      ii. Do one of the following.
         1. If you know the address you want to link to, type it into the **Address box**.
         2. Click one of the locations under **Look in**, and then locate and select the link you want
         3. If you don't know the address of a Web page, click **Browse the Web** icon (looks like a globe with a magnifying glass on it) to switch to your Web browser, open the Web page you want, and then switch back to Word.
   b. Link to a file you haven't created yet.
      i. Under **Link to**, click **Create New Document**.
      ii. Type a name for the new file. You can also specify the path to the new file and then choose whether you want to open the new file for editing now or later.
      iii. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want. Word uses the path or address of the file as the tip if you do not specify one.

B. Link to an e-mail address

1. Select the text or picture you want to display as the hyperlink, and then click **Insert Hyperlink** on the Standard toolbar.
2. Under **Link to**, click **E-mail Address**
3. Either type the e-mail address you want in the **E-mail address** box, or select an e-mail address in the **Recently used e-mail addresses** box.
4. In the **Subject** box, type the subject of the e-mail message.
5. **Note:** Some Web browsers and e-mail programs might not recognize the subject line.
6. To assign a ScreenTip to display when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

   Word uses "mailto" followed by the e-mail address and the subject line as the tip if you do not specify one.

Tip: You can also create a hyperlink to an e-mail address by typing the address in the document. For example, type **someone@graceland.edu**, and Word create the hyperlink for you.

C. Link to a specific location in another document or Web page

1. Open the file you want to go to and insert a bookmark at the blinking cursor [Insert/Bookmark…].
2. Open the file you want to link from, and select the text or object you want to make a hyperlink.
3. On the **Standard** toolbar, click **Insert Hyperlink**.
4. Under **Link to**, click **Existing File or Web Page**.
5. Locate and select the document that you want to link to.
6. Click **Bookmark**, and then select the bookmark you want.
7. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

   Word uses the path to the file including the bookmark name as the tip if you do not specify one.

Tip: From Word documents, you can create links to specific locations in files that are saved in Microsoft Excel (.xls) or PowerPoint (.ppt) format. To link to a specific location in an Excel workbook, create a defined name in the workbook, and then at the end of the file name in the hyperlink, type # (number sign) followed by the defined name. To link to a specific slide in a PowerPoint presentation, type # followed by the slide number after the file name.

D. Link to a location in the current document or Web page

1. To link to a place in the current document, you can use either heading styles or bookmarks in Word
2. In the current document, do one of the following:
   a. Insert a bookmark at the location to which you want to go.
   b. Apply one of Word's built-in heading styles to the text at the location to which you want to go.
3. Select the text or object you want to represent the hyperlink.
4. On the **Standard** toolbar, click **Insert Hyperlink**.
5. Under **Link to**, click **Place in This Document**.
6. In the list, select the heading or bookmark you want to link to.
7. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip**, and then type the text you want.

   For links to headings, Word uses "Current document" as the tip if you do not specify one; for links to bookmarks, Word uses the bookmark name.

Exhibit 2. Example of printing instructions 2 pages per sheet – Page 1 of 2

E. **Link to another file or program that you drag from**

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The text you copy must come from a file that has already been saved.

1. Display both files on the screen.
   If you are dragging text between two Word files, open both files, and then click **Arrange All** on the **Window** menu. If you are dragging text between two programs, resize the windows of both programs so you can see them at the same time.
2. In the destination document or worksheet, select the text, graphic, or other item to which you want to jump.
3. Use the right mouse button to drag the selection to your publication.
4. Click **Create Hyperlink Here**.

Notes:

- You can also copy and paste text as a hyperlink to achieve the same effect. Copy the text you want to the **Clipboard**, click where you want to insert the text, and then click **Paste as Hyperlink** on the Edit menu.
- You cannot drag and drop drawing objects, such as AutoShapes, to create hyperlinks. Use the standard hyperlink procedure to create hyperlinks for drawing objects.

F. **Link between frames**

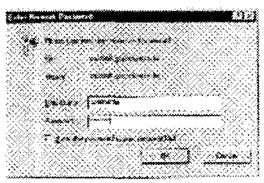
1. Select the text or picture you want to display as the hyperlink.
2. On the **Standard** toolbar, click **Insert Hyperlink**.
3. Do one of the following:
   a. Link to an existing file or Web page (see step A2a above)
      1. Under **Link to**, click **Existing File or Web Page**.
      2. Locate and select the file you want to link to.
   b. Link to a file you haven't created yet (see step A2b above)
      3. Under **Link to**, click **Create New Document**.
      4. Type a name for the new file. You can also specify the path to the new file and then choose whether you want to open the new file for editing now or later.
4. Click **Target Frame**. In the **Select the frame where you want the document to appear** list, click the name of the frame that you want the document to appear in, or click the frame you want in the diagram.
5. To assign a ScreenTip to be displayed when you rest the mouse over the hyperlink, click **ScreenTip** and then type the text you want.

Note: In addition to specifying a frame that you have named, you can also specify that a hyperlink will open a page in the same frame, in the "parent" frames page, or in a new window.

Exhibit 2. Example of printing instructions 2 pages per sheet – Page 2 of 2

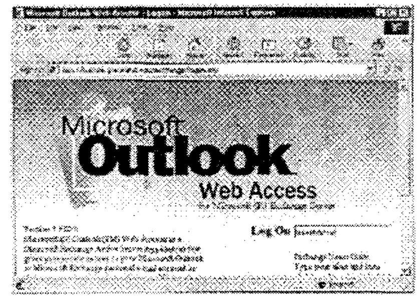
Using Your E-Mail Account

1. Turn on the computer by flipping the O/I rocker switch to the "I" position.
2. When the computer asks for a login press the **ESC** key. (This will work in the Break Room Lounge only). Go to step #4.
3. If you are using a computer in the EnterNet.C@fe or computer labs you might find a computer already on. If so, you can go directly to step #4. If you have to turn on the computer from scratch you may have to type in your **username** and **password**.

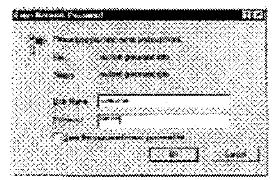


NOTE: Do **NOT** save the password in your password list. The next person to use the community computer would be able to log in as you and get into your e-mail.

4. Click twice on the Internet Explorer icon to turn on the Internet.
5. In the **Address** box type in **outlook.graceland.edu/exchange** and press the Enter key.
6. In the box on the gold Outlook page type in your **username**. Press Enter.

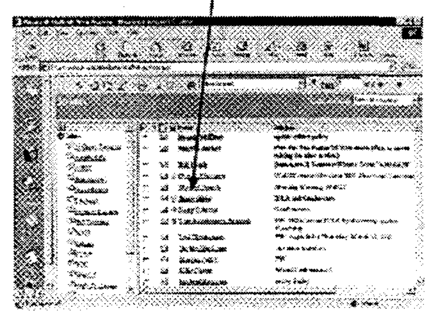


7. In the gray box type in your **username** and **password**. Click on **OK** or press Enter.



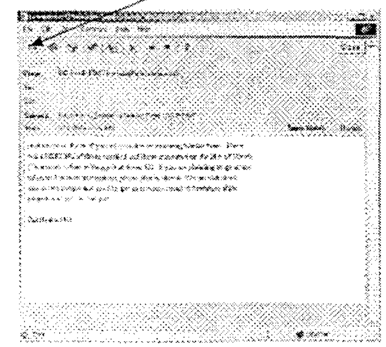
Read Your Mail

8. Click on name of Sender to read messages.



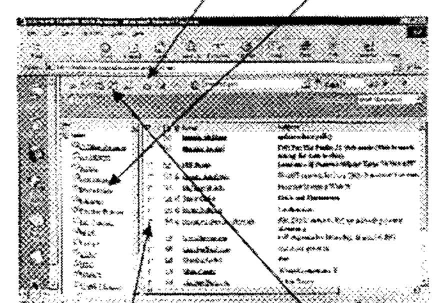
Reply to Messages:

9. Once message is open click on the **Reply** button and enter your message reply then click on the **Send** icon (see #13).



Save/Move Messages

10. Once you have read your message you can save it, if you wish. Create new folders and move the files to the appropriate folder

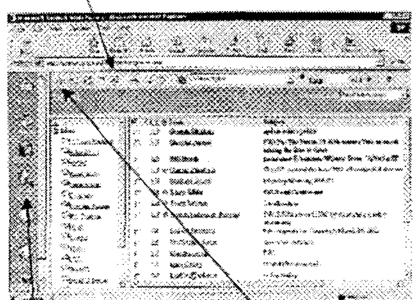


by selecting the check-box of the file you want to move then clicking on the Move icon.

Exhibit 3. Example of tri-fold brochure with screen shots – Page 1 of 2

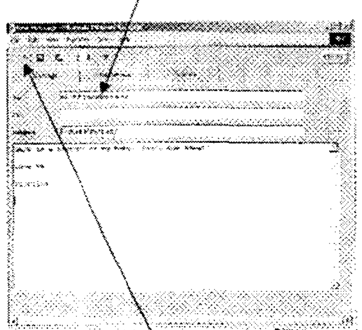
Deleting Messages

11. To delete a message select the check-box *preceding the message line and click on the* **Delete marked items** icon.



Sending New Messages

12. To send a message click on the **Compose New Mail Message** icon, type your message and address your message to the intended recipient. You can use the **Find Names** icon *to locate e-mail addresses of* people who work at Graceland.

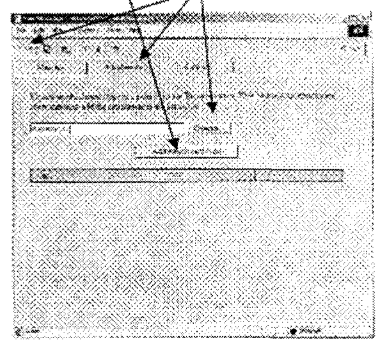


13. Click on the **Send** icon when finished.

NOTE: E-mail addresses consist of the person's username followed by the "@" (means "at") then the user's domain (in our case, it's "graceland") then a period, or "dot" before the type of institution. Our *institution is an educational institution so we use the* type ".edu" while others use .com (commercial), .net (network), or .gov (government) to name a few.

Sending Attachments

14. If you want to attach a picture or other file to your message select the **Attachments** tab then click the **Browse** button and locate the file you wish to send. Click on the **Add Attachment Now** button and **Send** your message.



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The Quick-And-Dirty Guide to Accessing Your Graceland E-mail Account

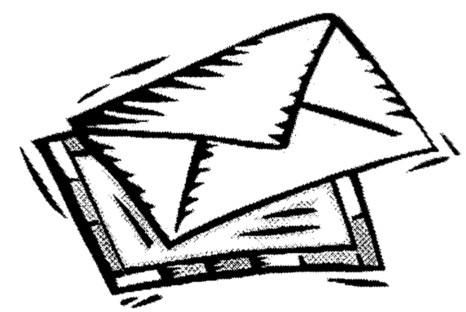

Exhibit 3. Example of tri-fold brochure with screen shots – Reverse side - Page 2 of 2

Using contacts for a mail merge in Outlook

A mail merge is when you add names and addresses to mailing labels, envelopes, form letters, catalogs, e-mails, or faxes for mass distribution. You can begin a mail merge from either Microsoft Outlook or Microsoft Word, and you complete it in Word, using either the Mail Merge Wizard or the Mail Merge toolbar. Note that you must use Word 2002 for the mail merge feature to work properly.

You can use your Outlook Contacts folder as the data source for the mail merge, providing the names and addresses that will be merged into the main document.

You can choose which contacts will be part of the mail merge in three ways:

- Select contacts from the Contacts folder by clicking them while holding down the CTRL key.
- Create a separate contacts folder and copy only the contacts you need to that folder.
- Create a custom view of the Contacts folder. For example, you can create a view that contains only your contacts from a particular state/ province and then send a custom e-mail message to them only.

Once you decide which contacts to include, you can further specify which contact fields to include. For example, you might want First Name, Last Name, Street Address, and ZIP/ Postal code, but not Country/ Region.

When you start a mail merge from Outlook, the contacts you select are exported to a temporary mail merge source file, to a printer, or to an e-mail message, depending on what option you choose. You can save the temporary mail merge source file if you want to use the same contacts for future mail merges.

Note Personal distribution lists in the Contacts folder cannot be included in a mail merge. You do not have to remove the personal distribution lists from Contacts, however. Outlook will ignore them.

Exhibit 4. Example of short instructions without numbered list

Use contacts as a data source for a mail merge in Outlook

1. Open the contacts folder. This can be your existing Contacts folder, or a folder you create and to which you copy only the contacts you want to be part of the mail merge.
2. Filter the current view of the contacts folder. For example, you can create a filter so that only contacts from a specified state or province are included in your mail merge.
   a. On the View menu, point to Current View, and then click Customize Current View.
   b. Click Filter, and then select the options you want. To filter by state/ province or another address field, in the Filter dialog box, click the Advanced tab, click Field, and then point to Address fields.
3. On the Tools menu, click Mail Merge.
4. Under Contacts, click an option.
5. Under Fields to merge, click an option.
6. Under Document file, click an option.

   To add merge fields to a document you've already created, click Existing document, and then click Browse to select the document.

   To create a new document for the mail merge, click New document.

7. If you want to save the current set of contacts in a merge file, select the Permanent file check box, and then click Browse to select the document.
8. In the Document type list, select the type of mail merge you want.
9. In the Merge to list, select where you want the merged records exported to. Distribution lists are not exported.
10. Click OK. Microsoft Word opens.
11. In Word, on the Tools menu, point to Letters and Mailings, and then click Mail Merge Wizard or use the Mail Merge toolbar.
12. Use Word Help for additional information.

Exhibit 5. Example of short instructions with numbered list

Using the Chat Room in WebCT

1. Login to WebCT (http://webct.graceland.edu) and navigate to your class.
2. Select the Chat tool either from the Navigation bar or the Homepage Communications Tools icon.
3. Select Room you wish to chat in. You will know who is in the room by the names listed in the Users Logged On window.
4. Type your comment or response in the message window at the bottom of the WebCT Chat window and press Enter to send the message.
5. To send a private message to one or several individuals, select their names in the Users Logged On window by clicking on them. They will highlight in blue. Your message will now be delivered only to the selected parties.
6. Click on names again to de-select. *If there are no names selected in the Users Logged On window, your message will go to ALL users currently logged on.*
7. To leave the chat session, simply click on the Quit button. You may enter another room if you wish.

Exhibit 6. Example of short instructions with numbered list

How to create a sound file for use in PowerPoint

1. Open up the Windows program "Sound Recorder" [start/Programs/Accessories/Entertainment/Sound Recorder]
2. Press the Spacebar to begin recording. Speak clearly into the microphone
3. Press Spacebar again to stop
4. Trim "dead air" at beginning and end of recording. Place drag button at beginning of sound, pull down Edit menu and select "Delete before current position," place drag button at end of sound and select "Delete after current position" from Edit menu
5. Save file
6. To create a second and subsequent sound file(s) create New file [File/New] and repeat steps 2-5.
7. Open PowerPoint
8. Insert as Sound File. This type of sound insertion is useful for narration of a slide. [Insert/Movies and Sounds/Sound from File...] Navigate to file and click Insert. This places a blue speaker icon in the center of the slide. This button can be set to play immediately when the file opens or can be set to operate only when the mouse clicks on it. The automatic type can be drug off the actual slide outside the viewing area to make it "invisible." Otherwise, it can be positioned anywhere on the slide to allow the user to click on it when they want.
9. Insert as an Action Button. This type of sound insertion is useful for more innovative sound utilization in slides. Create an Action Button by selecting AutoShapes in the Draw Toolbar [View/Toolbars/Drawing] and choosing Action Buttons. Select the Custom button (top left corner) and drag crosshairs on slide to create approximate size of the button. This creates a solid, colored button.
10. Select the type of button you wish to create. Choosing the "Mouse Click" tab will allow the user to click on the button to play the sound. "Mouse Over" will play the sound automatically as soon as the user moves the mouse cursor over the button without pressing the button.
11. Click in the "Play sound:" checkbox, pull down the selection box and scroll down to the bottom of the selection box and choose "Other sound..." The "Add Sound" dialogue box will come up. Navigate to a file you created in steps 2-5 above and click OK.
12. Right-click on the button and select "Format AutoShape..." For "Fill Color:" select "No Fill" and for "Fill Line:" select "No Line." Click OK. This makes the button invisible.
13. Repeat steps 9-12 as necessary for as many sound files as you want on a particular slide.

Exhibit 7. Example of medium-level task numbered list – 'Coke' brand of instructional sheet. Arial 12 point font. – Page 1 of 4

How to create a sound file for use in PowerPoint

1. Open up the Windows program "Sound Recorder" [start/Programs/Accessories/Entertainment/Sound Recorder]
2. Press the Spacebar to begin recording. Speak clearly into the microphone
3. Press Spacebar again to stop
4. Trim "dead air" at beginning and end of recording. Place drag button at beginning of sound, pull down Edit menu and select "Delete before current position," place drag button at end of sound and select "Delete after current position" from Edit menu
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11. Click in the "Play sound:" checkbox, pull down the selection box and scroll down to the bottom of the selection box and choose "Other sound..." The "Add Sound" dialogue box will come up. Navigate to a file you created in steps 2-5 above and click OK.
12. Right-click on the button and select "Format AutoShape..." For "Fill Color:" select "No Fill" and for "Fill Line:" select "No Line." Click OK. This makes the button invisible.
13. Repeat steps 9-12 as necessary for as many sound files as you want on a particular slide.

Exhibit 7. Example of medium-level task numbered list – 'Pepsi' brand of instructional sheet. Times New Roman 12 point font. – Page 2 of 4

How to create a sound file for use in PowerPoint

1. Open up the Windows program "Sound Recorder" [start/Programs/Accessories/Entertainment/Sound Recorder]

2. Press the Spacebar to begin recording. Speak clearly into the microphone

3. Press Spacebar again to stop

4. Trim "dead air" at beginning and end of recording. Place drag button at beginning of sound, pull down Edit menu and select "Delete before current position," place drag button at end of sound and select "Delete after current position" from Edit menu

5. Save file

6. To create a second and subsequent sound file(s) create New file [File/New] and repeat steps 2-5.

7. Open PowerPoint

8. Insert as Sound File. This type of sound insertion is useful for narration of a slide. [Insert/Movies and Sounds/Sound from File...] Navigate to file and click Insert. This places a blue speaker icon in the center of the slide. This button can be set to play immediately when the file opens or can be set to operate only when the mouse clicks on it. The automatic type can be drug off the actual slide outside the viewing area to make it "invisible." Otherwise, it can be positioned anywhere on the slide to allow the user to click on it when they want.

9. Insert as an Action Button. This type of sound insertion is useful for more innovative sound utilization in slides. Create an Action Button by selecting AutoShapes in the Draw Toolbar [View/Toolbars/Drawing] and choosing Action Buttons. Select the Custom button (top left corner) and drag crosshairs on slide to create approximate size of the button. This creates a solid, colored button.

10. Select the type of button you wish to create. Choosing the "Mouse Click" tab will allow the user to click on the button to play the sound. "Mouse Over" will play the sound automatically as soon as the user moves the mouse cursor over the button without pressing the button.

11. Click in the "Play sound:" checkbox, pull down the selection box and scroll down to the bottom of the selection box and choose "Other sound..." The "Add Sound" dialogue box will come up. Navigate to a file you created in steps 2-5 above and click OK.

12. Right-click on the button and select "Format AutoShape..." For "Fill Color:" select "No Fill" and for "Fill Line:" select "No Line." Click OK. This makes the button invisible.

13. Repeat steps 9-12 as necessary for as many sound files as you want on a particular slide.

Exhibit 7. Example of medium-level task numbered list – 'RC Cola' brand of instructional sheet. Comic Sans 10 point font. – Page 3 of 4

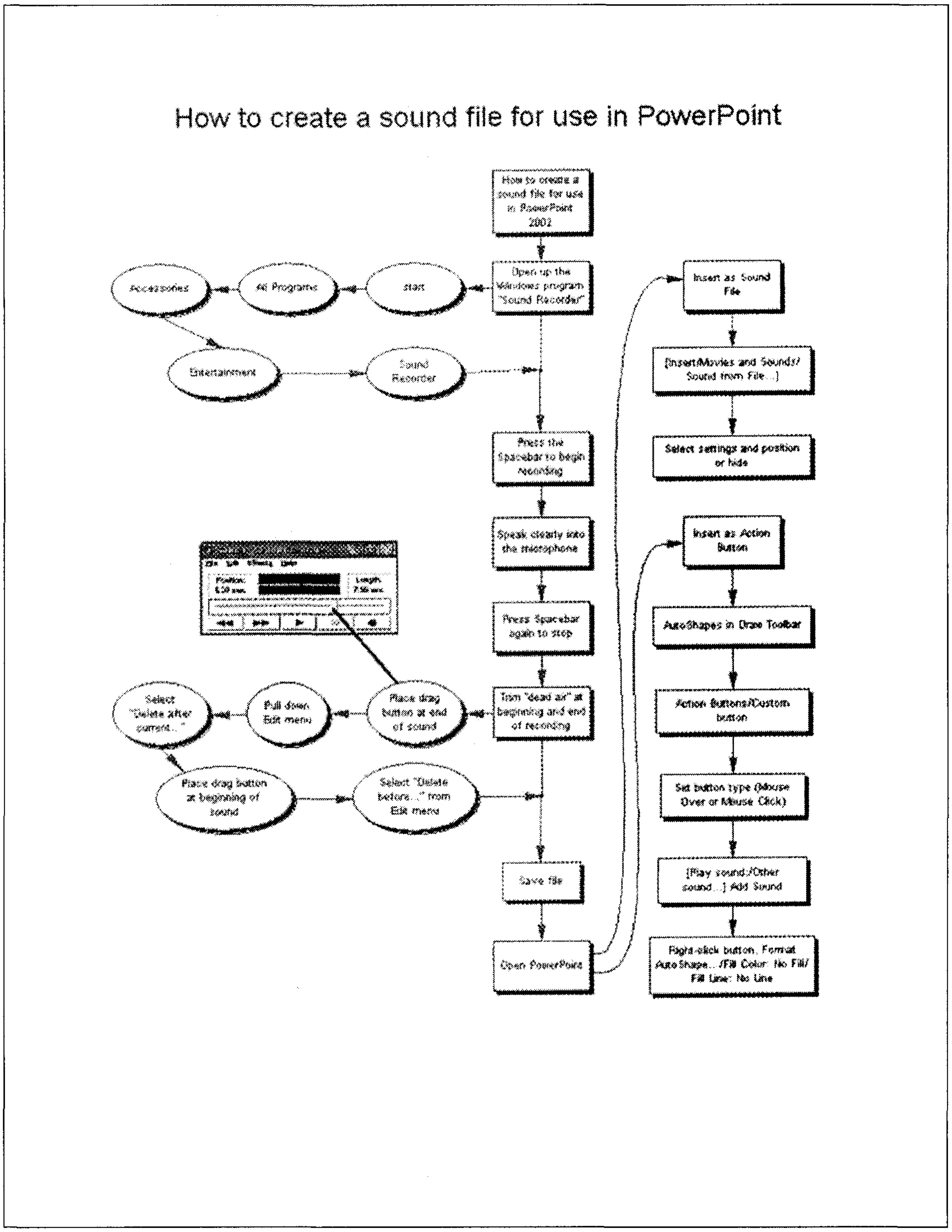


Exhibit 7. Example of medium-level task numbered list – Reverse side of 'Coke' brand of instructional sheet. Inspiration™ document – Page 4 of 4

Route a Word file with Outlook

1. Open the file you want to route.
2. On the File menu, point to Send To, and then click Routing Recipient.
3. To select recipients, click Address.
4. In the Type name or select from list box, enter a name, and then click To. Repeat this step for each additional recipient, and then click OK.
5. Select the routing options you want.

   For Help on an option, click the question mark, and then click the option.

6. Do one of the following:
   - To route the file, click Route.
   - To close the dialog box without routing the file, click Add Slip.
   - To route the file at a later time, open it, click Send To on the File menu, and then click Next Routing Recipient.

Tips:

- When you route a file, it is sent as an attachment in an e-mail message. You can select a group alias as the recipient; however, all members of the alias are considered one recipient. To route to members of a group alias one after another, route it to individual members instead of to the alias.
- You can change the order in which recipients receive the routed file by changing the order of names in the To list. Select the name you want to move up or down in the list, and then click the appropriate arrow.

Exhibit 8. Example of simple task numbered list – Page 1 of 2

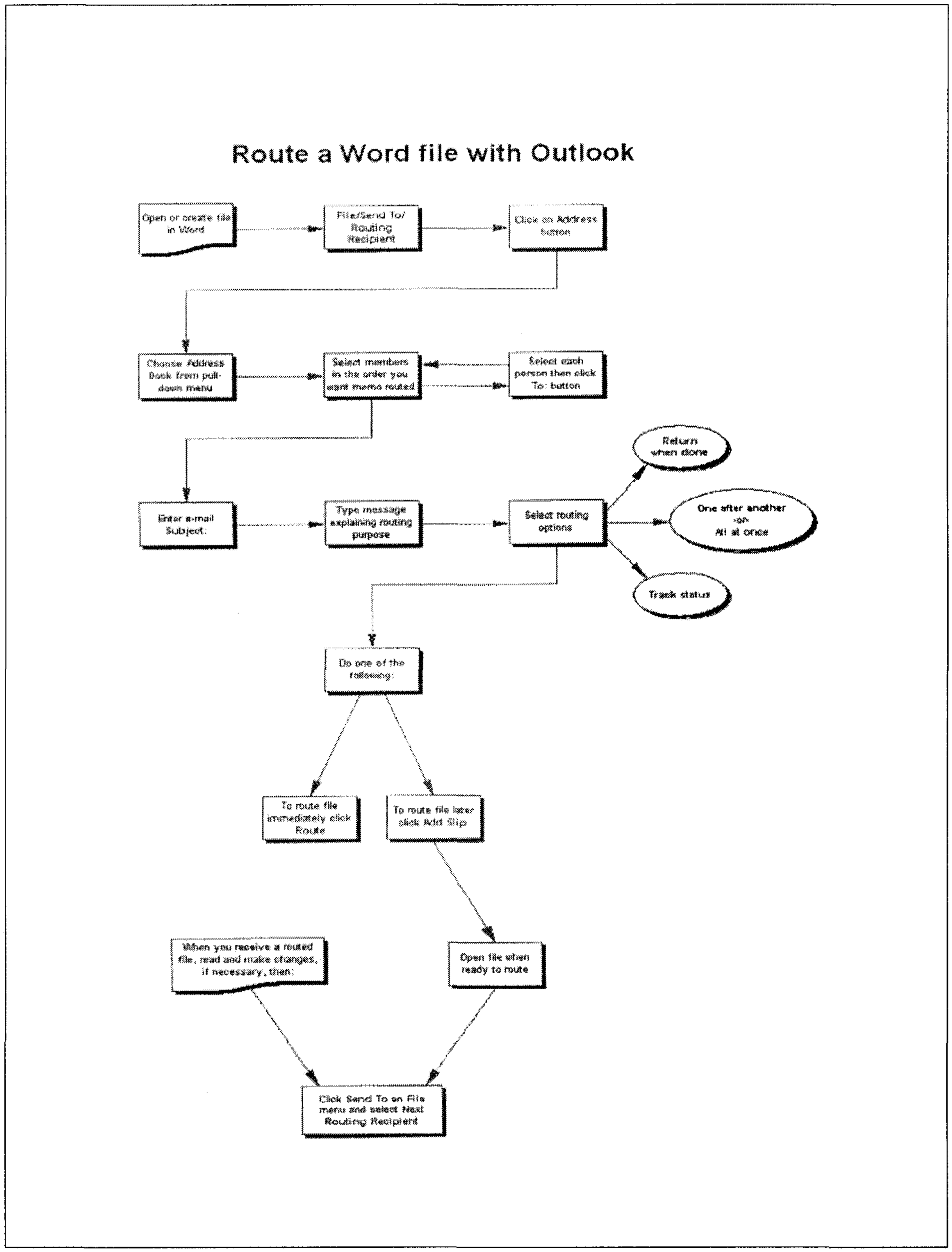


Exhibit 8. Example of simple task numbered list, reverse side – Page 2 of 2

Create a distribution list in Outlook

Create a distribution list using names in the Address Book

1. On the File menu, point to New, and then click Distribution List.
2. In the Name box, type a name.
3. Click Select Members.
4. In the Show names from the list, click the address book that contains the e-mail addresses you want in your distribution list.
5. In the Type name or select from list box, type a name you want to include. In the list below, select the name, and then click Members. Do this for each person you want to add to the distribution list, and then click OK.

   If you want to add a longer description of the distribution list, click the Notes tab, and then type the text.

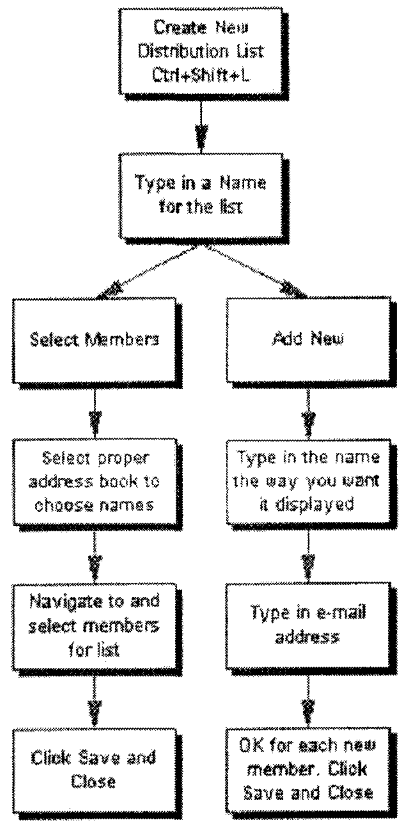
   The distribution list is saved in your Contacts folder by the name you give it.

Create a distribution list by copying names from an e-mail message

1. In the e-mail message you want to copy the names from, select the names in the To or Cc box.
2. On the Edit menu, click Copy.
3. On the File menu, point to New, and then click Distribution List.
4. In the Name box, type a name for the distribution list.
5. Click Select Members.
6. In the Add to distribution list list, right-click, and then click Paste on the shortcut menu.

Exhibit 9. Example of simple task numbered list – Page 1 of 2

Create a distribution list in Outlook



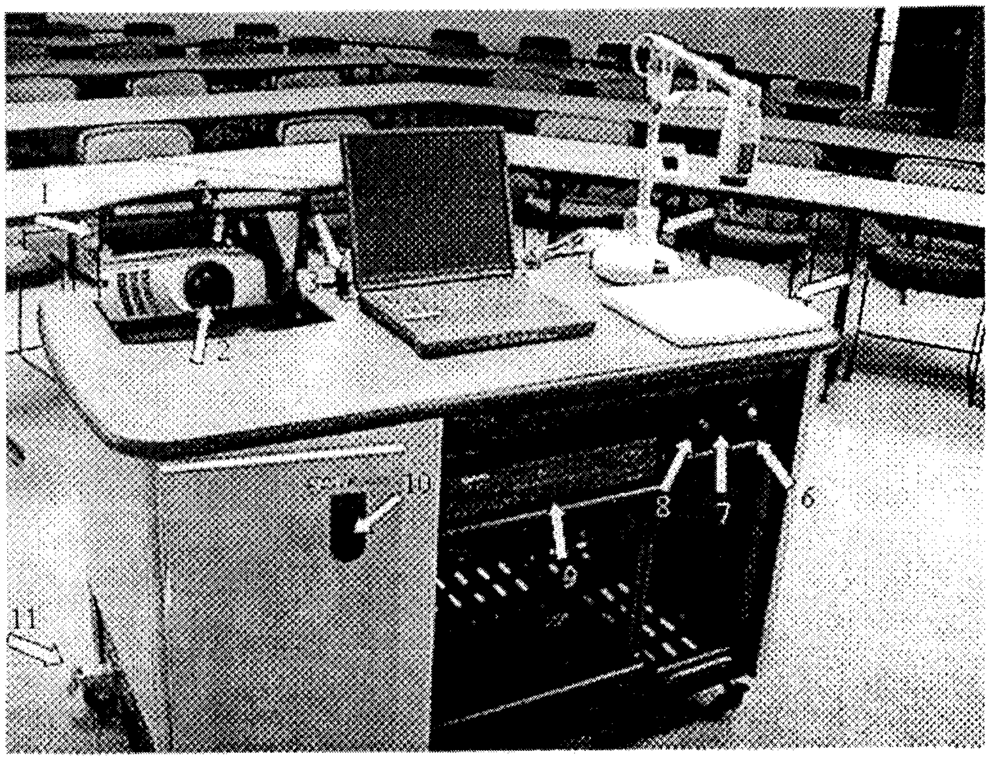
To use the new Distribution list simply type the name of the new list in the To: field or navigate to it by selecting your Contacts folder and locating alphabetically.

Exhibit 9. Example of simple task numbered list, reverse side – Page 2 of 2

APPENDIX C

Smart Expression Multi-Media Presentation Table

Smart Expression A/V Table



1 Mirror Lid
2 Data Projector
3 Control Panel
4 Visual Presenter
5 Light Table
6 Wireless Mouse
7 Samsung Remote
8 Sony Remote
9 VCR
10 Door Button
11 Locking Wheel

Exhibit 1. Photo representation of Smart Expression Multi-Media Presentation Table

APPENDIX D

Dialogue Sample from Transcripts

Transcript of Third Team Meeting

Tuesday, October 08, 2002 – 2:00 p.m.

==Begin Tape==

RE Last time we met I handed out a few things and we went over an article that I had read and thought would be valuable to you. I got to thinking that I have not shared even what my project literature review found or what we were looking for or even doing so what I thought I would do is actually give you a copy of this little tome here just for your perusal at your own convenience. I added some numbers to the side just to make it easier to talk about some things that I did find through the literature review. I also brought with me an article about NCATE Projects that I got on-line on the Internet and one of the things it talks about—this was a task force on technology in teacher education—and this was a thing that NCATE did to a research project that ISTE, the International Society of Teacher Education and the Milliken Foundation did together to find out some things about teacher education and what's happening in higher education teaching pre-service teachers and what's happening to our teaching force across the nation. And they came up with some recommendations but they sort of outlined what the problem was. I wanted to read here just a couple of paragraphs. "Challenges to Teacher Education" is the heading and the first paragraph says, "Re-educating the existing teacher force will not be easy and will require extensive professional development over many years. The problem will be greatly compounded if those teachers entering the profession now, and in the future, have not been adequately prepared to use the new technology." Then on down it says, "To what degree are higher education institutions meeting the responsibility for preparing tomorrow's classroom teachers?" You know, what responsibility do you guys have? It says, "Bluntly, a majority of teacher preparation programs are falling far short of what needs to be done. Not using technology much in their own research and teaching, teacher education faculty have insufficient understanding of the demands of classroom teachers to incorporate technology into their teaching. Many do not fully appreciate the impact technology is having on the way work is accomplished. They undervalue the significance of "technology" and treat it as merely another topic about which teachers should be informed. As a result, colleges and universities are making the same mistake that was made by P-12 schools; they treat technology as a special addition to the teacher education curriculum requiring specially prepared faculty and specially equipped classrooms but not a topic that needs to be incorporated across the entire teacher education program. Consequently, teachers-in-training are provided instruction in "computer literacy" and are shown examples of computer software but they rarely are required to apply technology in their courses and are denied role models of faculty employing technology in their own work." And that's what I am basing my whole dissertation on is the "role model" of this providing technology instruction. And, not just assigning things, not just showing them what's available and so forth, but actually *living* it. OK? "Many teacher education faculty lack the knowledge and skill to incorporate technology into their own teaching." Do you find that true? I think, based upon the interviews that I did with all of you, you said that you weren't necessarily that comfortable with it. "Similar to P-12 teachers, they have not been provided the training they need to use technology successfully." And that's true. You haven't been. It's just been thrown in your lap and they say, "Use it" and you're going, "Aahh. I'd love to use it." But then when push comes to shove it's a whole lot easier to do things the way they've always been done.

CC See, I don't think I agree with that assessment.

RE OK

CC Now, that might be true for your guy's experience [to AA and BB] but my experience...I don't agree with a lot of what that said. It hasn't been thrust into our lap and placed in our classrooms and we're choosing not to use it. It is not accessible. You go to any of our classrooms, with the exception of a Smart Cart there is no accessibility to integrate technology into our curriculum. We have to reserve a lab, which is very difficult, we have to go through this pretty elaborate process to be able to integrate curriculum into what we do. We're going to walk kids across campus all the way over there [to the library] and give them a fifteen minute period, or have them meet us there...they can't get passwords... There's all kinds of things like that. It's not like a classroom...It's not like what I had this summer. What I had this summer...they were on those computers doing research three-quarters of the time. We used it. They went all over the world to find out the information that they had. We incorporated email as part of reflections and all those kinds of things. OK? But I don't find that I'm walking into a classroom with twenty students and I've got all this technology available to me and I'm just not using it because I haven't been trained to use it. That's *not* my experience. And I think that if we had classrooms where we could put every student on a computer or put two students per computer I think a lot of us would do a whole lot more than we do. Instead of all these handouts we'd give websites and we'd have them go explore and find their own information and those kinds of things. I *do* think we know how to do those things. But I don't think technology is readily available to us at all.

RE So, you feel access is more of an issue?

CC It's a major issue for me.

RE Now, do you feel that's more of an issue off campus than it is here?

CC I have better access off-campus than I have here.

RE Do you?

CC We can go in to Independence and they all have the wireless and they can get on. Right?

AA Yes.

CC I go to Centerville and she has the lab reserved for me every night. We can have class in the lab if we want to every night.

RE You said something about the Smart Expression Tables being not available or...

CC The smart cart...I can do PowerPoint on. I can show videos. I can do that. But I can't put twenty kids on one smart cart.

BB That was a problem I had last night, too, Ron, because we tried to do some Web searches for their research projects and, so, the problem is I have one computer and I have eight students who are all wanting to do the same thing. So, it worked for one person but, in essence, it would have been much better if I would have had a classroom like CC was talking about where we could have everybody looking and searching at the same time.

CC Even if you had everybody…even things as small as a printer. Even if you've got people searching at the same time, unless they remember everything that they went to or just stop and write it down…so I just might as well as give them a handout.

BB Right.

CC If they can't print it out, if they can't access it to use later it's almost useless. We found out this summer with the group, every group was on computers this summer in this course I did. It was great. And we all had a printer to print to. We did the first day with the computers but no printer. And we found it was a waste of time. They had to go right back down and try to find an empty computer in the library and it splintered our class and everybody kind of went their own way for one day. And we all came back and said, "We gotta have a printer" because they liked being able to do the research and to bounce the ideas and to email me their reflections and all those kinds of things. I don't think it's accessible at all.

RE OK. What you're talking about is a total classroom using technology.

CC Well, you go back and re-read those paragraphs you just read. It said, and I think it was on the previous page, it said something to the effect of, "We've had all of this technology thrust on us but we don't know what to do with it."

RE What I read was that, "Schools treat technology as a special addition to teacher education curriculum requiring specially prepared faculty and specially equipped classrooms."

CC Which doesn't exist here.

RE OK, but, "They are rarely required to apply technology in their courses and are denied role models of faculty employing technology in their own work."

CC That's the two things I'm saying. There aren't any classrooms equipped with technology. Therefore, 2. there aren't faculty being role models using technology. It doesn't exist in these classrooms.

RE OK. I guess where I'm trying to get to…

CC How would I role model that?

RE Well, this is how I would role model. If I were in your shoes doing your teaching and so forth I would role model by having my computer at the Smart Expression Table, open up different sites and maybe do some research like we did with the WebBrain or maybe an ERIC search or something like that, possibly even printing out some of the things.

CC I did that in California last weekend, by the way.

RE Oh, did you?

CC Yeah.

RE I want to hear about it in your reflections.

CC Well, yeah. They had to do research on character education but I said, "Here's two search engines I want you to go to. I want you to use WebBrain and I want you to use Ask Jeeves. And so, there was a lot of feedback on that. A lot of them hadn't even heard of those two things. We had a real hard time finding education-specific things without typing out the topic. So, when we typed in the topic it wasn't any different than using Google. It just gave us some sites to visit. We weren't able to use the whole WebBrain because there weren't any education-specific places. I sat there with them for half an hour and I couldn't find anything either. We would type in a topic and we would just get a list of sites to go visit. But the Ask Jeeves... they got a lot out of that and they found another way to access information and we worked through that. So we did do that. But that's a campus where they've all got computers right there at their desk and it's all wireless and we can do that and I can interact and I can move about and they're not half in the library and half in the computer lab or in the Mac lab.

RE But, another way I would use it would be as a discussion tool. I know it's limited but at the same time I could use it for possibly pulling up some things or maybe a document I've been working on or even with Inspiration or something and use it as a tool up at the front. Instead of a chalkboard we could actually use this tool to communicate with places around the world and get some feedback from places. If you want to limit technology to computers we can do that for right now. I look at a computer and I say, "What can a computer do that I can't do normally with chalk, chalkboard, an overhead projector and things we've used for 25, 30, 40 or 50 years?" I think of communication as one thing. You see students using these instant messaging communication tools to get with someone to ask them questions and to do things. You could do the same thing with some expert from another university or from a business or a governmental agency or something like that. But they could actually communicate with your class live, and ask them questions and so forth. The other thing is research. It is so easy to do some research on-line than it was even four years ago. It's important to know how to use a research library and to actually get in and dig to find some things but it's also real easy to at least get the base information. We used to send all of our kids to the encyclopedia to get information and they'd end up copying the three or four paragraphs and they were done with their report.

CC I've told you about the big differences I've seen... and I've talked with [a couple of faculty members down in Independence], and I don't mean this in any way to be disrespectful but, whenever you go into most of these offices up here it is bookcase after bookcase after bookcase of books and you talk to [an Independence faculty member] and myself you'll find maybe one bookshelf of books but it's like we don't collect those things. And I've had [the dean] walk in and go, "How can you not want more book space to get these books?" And it's because I guess we have a belief, whether it's right or wrong, we can access anything they have in those books without having the book. We can get to it through the Internet. We can get there somehow. And if we really need the book we're not more than 24 or 48 hours away from getting the book.

BB And I differ with you in that I will do that sort of thing for the most current and up-to-date sorts of information but I like the fact that I can reach on the shelf and I have things that I have highlighted. I have my side-notes in and all that sort of thing. And so, I find the valuable things that I have spent time reading and so forth and I don't want to discard that.

CC Right. And I would say I have the same things in files under Bloom and files under whatever. I've printed those things out and I've highlighted on those. And so, I have those excerpts but I don't have the books but I'll have a file on those people and that sort of thing. But it's interesting that there is that little bit of a divide. The other thing, though, that to me, Ron, the stuff that you were describing… In the constructivist classroom, as I understand it, and you've worked with it a lot longer than I have…everything you described to me is still lecture. It's still information coming from a screen or a person at the front of the room while everybody in the room sits and takes notes and watches. It's not interactive. There's nothing grouped. There's nothing constructivist about it. It's still another form of lecture and I think you can model without everything coming from one spot in the room. And so, that's why I like to think… everything you've said, that's modeling, yes. But I like to be able to do that while everybody else is doing it too. And then I can turn them loose and, "OK, now I've got you there. Spend ten minutes at that site and here's three questions you're going to try to answer at that site" as opposed to me navigating and answering those three questions while they're all sitting and taking notes and I just…

RE What would happen if we were able to split the group into, say, five groups and each group had a computer.

CC Even that would work.

BB Yes. That would be better.

CC We have zero up in these classrooms.

Appendix E

Readings Discussed in Bi-Weekly Team Meetings

Team Meeting #1

U.S. Congress, Office of Technology Assessment (1995). *Teachers & technology: Making the connection* (OTA-EHR-616). Washington, D.C.: U.S. Government Printing Office, April.

Team Meeting #2

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Team Meeting #3

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Team Meeting #6

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Team Meeting #7

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Team Meeting #8

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Appendix F

Human Subjects Approval

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Research and Advanced Studies
Office of the Vice Provost
2810 Beardshear Hall
Ames, IA 50011-2036
515/294-6344
FAX: 515/294-6100

April 9, 2002

This is to certify that Ronald Ellis completed web-based training on the protection of human subjects in research.

The web-based training covered the following topics:

- the historical perspectives of human subjects research
- the Belmont Report
- the federal regulations
- assurances of compliance
- Institutional Review Board (IRB) composition and duties
- elements of informed consent

In addition, we provide access to the Belmont Report, the Iowa State University Multiple Project Assurance filed with the Office for Human Research Protections through the Human Subjects Review web site at http://grants-svr.admin.iastate.edu/VPR/humansubjects.html, and the outline of the Iowa State University training program. The outline included information on issues in behavioral and social science research, ISU policies and procedures, and resources available on the World Wide Web.

Rick Sharp
IRB Chair

Wolfgang Kliemann
Associate Vice Provost for Research &
Institutional Official Responsible for
Human Subjects Research

Exhibit 1. Certification of Human Subjects training

Iowa State University Human Subjects Review Form

OFFICE USE ONLY		
EXPEDITED X	FULL COMMITTEE ____	ID# 03-072

PI Last Name Ellis **Title of Project** Finding Ways to Promote Faculty Development to Help Preservice Educators Model Technology in the Classroom: An Action Research Case Study

Checklist for Attachments

The following are attached (please check):

13. ☒ Letter or written statement to subjects indicating clearly:
    a) the purpose of the research & a statement that the study involves research
    b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see item 18)
    c) an estimate of time needed for participation in the research
    d) if applicable, the location of the research activity
    e) how you will ensure confidentiality
    f) in a longitudinal study, when and how you will contact subjects later
    g) that participation is voluntary; nonparticipation will not affect evaluations of the subject
    h) contact information of the P.I. and if a student project, the major professor or supervising faculty member's contact information
14. ☒ A copy of the consent form (if applicable)
15. ☒ Letter of approval for research from cooperating organizations or institutions (if applicable)
16. ☒ Data-gathering instruments
17. ☒ Recruitment fliers or any other documents the subjects will see

18. Anticipated dates for contact with subjects. Allow at least two weeks for review of your proposal before your anticipated start date

First contact
~~9/2/02~~ upon approval / 8/28/02
Month/Day/Year

Last contact
12/12/02
Month/Day/Year

19. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

12/20/02
Month/Day/Year

20. Signature of Departmental Executive Officer — Date 8/28/02 — Department or Administrative Unit C&I

If the PI or co-PI is also the DEO, a Dean signature authority must sign here.

21. Initial action by the Institutional Review Board (IRB):

☒ Project approved ☐ Pending Further Review ____ Date ☐ Project not approved ____ Date

☐ No action required ____ Date

22. Follow-up action by the IRB:

Project approved ☐ Project not approved ____ Date Project not resubmitted ____ Date

Rick Sharp
IRB Chairperson

Signature of IRB Chairperson

9/4/02
Date

1/02

Exhibit 2. Human Subjects Review Form

ISU IRB #1
APPROVED DATE: September 4, 2002
EXPIRATION DATE: September 3, 2003

INFORMED CONSENT DOCUMENT

Title of Study: **Finding Ways to Promote Faculty Development to Help Preservice Educators Model Technology in the Classroom: An Action Research Case Study**

Investigator: **Ronald A. Ellis, M.S.**

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to provide insight into the ways staff development is useful in promoting the use and modeling of technology in the preservice classroom. You are being invited to participate in this study with colleagues who are also classroom teachers in the School of Education and are looking for ways to improve the use of technology in your classrooms.

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, your participation will last for fifteen weeks beginning September 2, 2002 and ending the second week of December 2002. During the study you may expect the following study procedures to be followed: You will be asked to participate in pre- and post-study audio-taped interviews, bi-weekly collaborative audio-taped meetings, and weekly cooperation with myself, as an advisor and the primary investigator (PI), during class presentations and provide the PI with artifacts of technology modeling. You will also keep a reflective journal to be shared with the PI during the study and will be given the opportunity to share them with other participants, if desired. Recordings of interviews and meetings will be transcribed and given to the participants to edit.

RISKS

While participating in this study you may experience the following risks: possible embarrassment through stray comments in recorded meetings or interviews and the risk of more time demands for yourself as a result of journaling and meetings.

BENEFITS

If you decide to participate in this study you will have the benefit of having me as a personal advisor for more time than would be normally committed. It is hoped that the information gained in this study will benefit society by giving examples of what works and doesn't work in staff development methods to help faculty model technology in their classrooms. It may benefit your own research and evaluation using your own recorded interviews, collaborative meetings and artifacts.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

DKA 5/15/02 1

Exhibit 3. Informed Consent document – Page 1 of 2

ISU IRB #1
APPROVED DATE: September 4, 2002
EXPIRATION DATE: September 3, 2003

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. You will have the right to edit any and all raw data collected. Each of you will also be given free access to transcripts of all group meetings and your individual interviews, reflective journals and classroom artifacts, and may draw your own conclusions and may publish your own version of the study.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: Since there are so few in the study, pseudonyms will be used for each participant. These pseudonyms will be gender-free and will be used throughout the study. For information about the study contact Ron Ellis at (641) 784-5467; ellis@graceland.edu or his major professor, Dr. Niki Davis at (515) 294-5596; nedavis@iastate.edu. If you have any questions about the rights of research subjects or research-related injury, please contact the Human Subjects Research Office, 16 Pearson Hall, (515) 294-4566; meldrem@iastate.edu or the Research Compliance Officer, Office of Research Compliance, 2810 Beardshear Hall, (515) 294-3115; dament@iastate.edu

****

SUBJECT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject's Name (printed) ____

______________________________ ______________________
(Subject's Signature) (Date)

INVESTIGATOR STATEMENT

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

______________________________ ______________________
(Signature of Person Obtaining Informed Consent) (Date)

Exhibit 3. Informed Consent document – Page 2 of 2

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Human Subjects Research Office
2810 Beardshear Hall
Ames, IA 50011-2036
515/294-4566
FAX: 515/294-7288

TO: Ronald Ellis

FROM: Janell Meldrem, IRB Administrator

PROJECT TITLE: Finding Ways to Promote Faculty Development to Help Preservice Educators Model Technology in the Classroom: An Action Research Case Study

RE: IRB ID No.: 03-072

APPROVAL DATE: September 4, 2002 **REVIEW DATE:** September 4, 2002

LENGTH OF APPROVAL: 1 year **CONTINUING REVIEW DATE:** September 3, 2003

TYPE OF APPLICATION: ☒ **New Project** ☐ **Continuing Review** ☐ **Modification**

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only, are attached. Please make copies from the attached "masters" for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

If this study is sponsored by an external funding source, the original Assurance Certification/Identification form has been forwarded to the Office of Sponsored Programs Administration.

The IRB must conduct **continuing review** of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI's responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. **Please note the continuing review date for your study.**

Any **modification** of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

You must promptly report any of the following to the IRB: (1) **all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems involving risks to** subjects or others.

HSRO/ORC 8/02

Exhibit 4. Human Subjects approval letter – Page 1 of 2

Approval letter
Page 2
Ellis

Your research records may be audited at any time during or after the implementation of your study. Federal and University policy require that all research records be maintained for a period of three (3) years following the close of the research protocol. If the principal investigator terminates association with the University before that time, the signed informed consent documents should be given to the Departmental Executive Officer to be maintained.

Research investigators are expected comply with the University's Federal Wide Assurance, the Belmont Report, 45 CFR 46 and other applicable regulations prior to conducting the research. These documents are on the Human Subjects Research Office website or are available by calling (515) 294-4566.

Upon completion of the project, a Project Closure Form will need to be submitted to the Human Subjects Research Office to officially close the project.

HSRO/ORC 8/02

Exhibit 4. Human Subjects approval letter – Page 2 of 2

Acknowledgements

Over the past several years my life's path has taken a circuitous route. My life has been a mixed blend of happiness and heartbreak interrupted by this dissertation which was always hanging around somewhere in the back of my mind calling me to work on and ultimately finish. I would like to thank many people along that path, for without their help or encouragement I may never have achieved my goal.

My special appreciation goes to Dr. Niki Davis who not only chaired my dissertation committee but helped me become a better and more critical writer. Thank you for taking a chance on a student you never had for a class and barely knew. Also, thank you for your quick turn-around on rough draft comments and going out of your way sometimes to help me keep my tight timeline. I also wish to thank others that served on the committee that offered critical advice and support; Dr. Ann Thompson, Dr. Peter Boysen, and Dr. Jerry Willis, even though he could not finish the project with me. Many thanks to Dr. Patricia Leigh for stepping in at the last minute in Jerry's absence not knowing me, the project, or other expectations. My sincere appreciation is offered to Dr. Don Rieck who stuck with me over the years and agreed to be on not only my first committee, but stayed with me through some rough personal times and agreed to be on my second committee even though the methods of research for my project might not have been entirely in his comfort zone.

I want to thank Jamie Rehlander, Phyllis Kendall, and Judy Weiland for helping me organize meetings, deliver papers, register me for credit hours, and for doing general gopher work which has been inconvenient for me since I live so far from campus. Your kindness and help have not gone unnoticed.

My heartfelt thanks go out to my friends and colleagues who always asked how I was doing and offered support as I took this journey toward higher education; Dr. Steve Anders, Dr. Bill Armstrong, Dr. Dave Devonis and his wife Deborah Rowe, Dr. Jack Gittinger, Dr. Willard Johnson, Karen Robb, Bob Farnham, Dr. Jim Hawley for helping me get through statistics, Dr. Bill Heath, and Rob Stephens. A special thanks to Dr. Barb Wilmes, Dr. Rich Rogers, and Nancy Halferty whose help was paramount in helping me be successful in my research. Thanks to Dennis McElroy for being a great support and offering an ear to bend while we struggled through some of the same trials and roadblocks, and for his willingness to allow me to take time off from work to write when he was my supervisor. Also, thanks to Kam Mahi and Ron Harmon for allowing me the freedom and support to take long weekends to study and write and to let the job slide just a bit so I could meet deadlines. My appreciation goes to Don Breshears and the entire church choir for understanding why I couldn't practice or participate this past semester. Also, to my good friends "Tex" and Marsha Jackel and Cliff and Janie Neeley, dust off the cards. It's time for a good game of rummy.

I am truly grateful to Dr. David Clinefelter for giving me the opportunity to work at Graceland College and for encouraging me early on to finish what I started. I wish to thank Margaret Martin for taking the time to edit my manuscript and helping me to get things "in order." She helped me see things in my writing that I never would have caught.

My children Sarah and Macey have been truly patient with me over the past several years and I appreciate them understanding when Dad had to work on the research project instead of helping them with homework or just hanging out. Thanks, kids. You have been great. I'm sorry I missed out on so much of your lives. Thanks to Drs. Andy and Sue Dungan for the wonderful camping trips and dinner parties that allowed me to "decompress" and be comfortable enough to bounce some ideas back and forth with. Also, for their unyielding friendship even though the miles now separate us. Praise the Lord for e-mail.

I would be remiss if I didn't thank my mom and dad, Collene and Bruce Ellis for their continued support, prayers, and brief daily encouragement over the Internet. Thank you for believing in me and for instilling in me a sense of quality and determination. Thank you for giving me an early love of education and life-long learning. I also want to thank my wife's mother, Joan Clark for her cheerful encouragement and unflagging faith that her daughter would someday be married to a doctor. Also, to my father-in-law, Dr. Sam Clark, I gained much support from you early on as I struggled with the process of getting a degree and would not have gone as far as I did without your encouragement. Mom and Dad, you both are truly missed. I hope I make you proud.

Last, but most importantly, to my lovely wife, Bobbi, I give you the most credit for helping me stay focused. Thank you for pulling me away from the television and pushing me out the door to go study. An entire third of our marriage and one fifth of my life has been spent in quest of this terminal degree. I look forward with great anticipation to getting

reacquainted with you. It has been a long trip, but hopefully the destination will be worth it. God bless you for your support and love these past many years. I apologize for the lonely times I was unable to share in your life and for the times you felt like a research "widow." I know the "honey-do" list is waiting but, first, can we just cuddle for awhile?